The Ministry of Education and Technical Education dedicates this book with love to the students, teachers, and families of the Arab Republic of Egypt

Science

4

Primary Stage - Grade 4

First Term

Name:

Class:

School:

Supervised by: Central Administration for Curriculum Development

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Introduction

It is with great honor that we present this new science textbook for Egypt. This textbook is designed to lay a strong foundation of academic skills that will empower Egypt’s next generation to thrive and contribute meaningfully to the society of tomorrow.

We, **SPRIX Inc.**, are a comprehensive education company based in Japan, committed to delivering high-quality education to children worldwide under our philosophy, **"Education Springs New Life.”** As part of this mission, we have gained significant insights by understanding and analyzing the current state of fundamental academic skills within Egypt through **TOFAS (Test of Fundamental Academic Skills).**

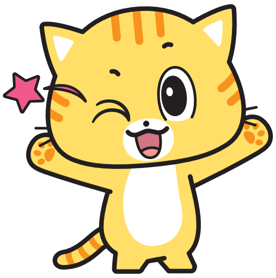
Drawing on the valuable insights from TOFAS and inspired by the rigor and structure of the Japanese science curriculum, we have carefully tailored this textbook to suit the unique educational context of Egypt. It is structured to support a gradual and thorough development of scientific knowledge, spanning five core domains: **Life Science, Earth Science, Physical Science, Chemical Science.**

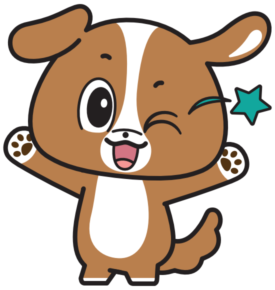
Our goal is for students to cultivate a scientific mindset and to acquire the ability to think logically and apply scientific concepts not only in daily life but also across various academic disciplines.
We sincerely hope that this textbook becomes a valuable companion in the learning journey of every student, making the study of science both meaningful and enjoyable.

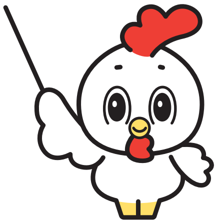
Hiroyuki Tsuneishi
President and CEO
SPRIX Inc.

Let’s Learn Together!

Characters:


Brainy


Smarty


Genius

Primary 4
Science

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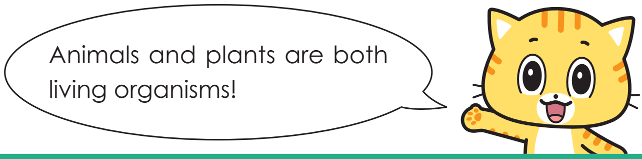
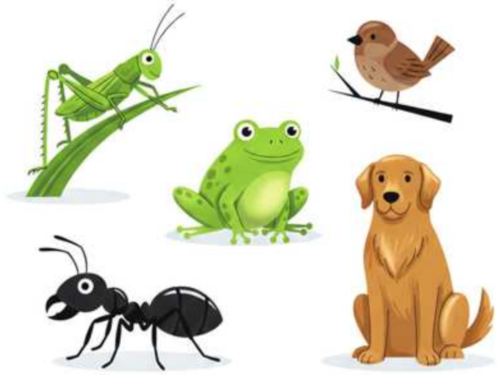
1-1 Let's Find Living Organisms

Chapter 1 ····· *Nature in Our Surroundings*

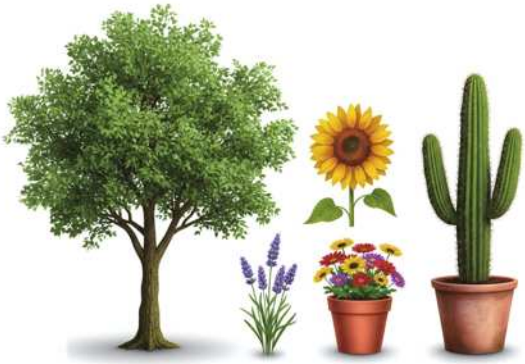

Animals and plants are both living organisms!

Living Organisms

Animals



Plants



Point! Let's think about "Habitats"

"Habitats" of living organisms

- Living organisms, such as humans, animals, and plants, differ from non-living things, such as rocks, water, and air. Living organisms carry out essential life processes, including obtaining nutrition, respiration, and growth.

- **Where living organisms are**

Near grass or trees:
Places with **food** or places easy to **hide**.

Under stones or shade of rocks:
Places with **dampness (water)** or cool places away from the sun.

Living to match the environment

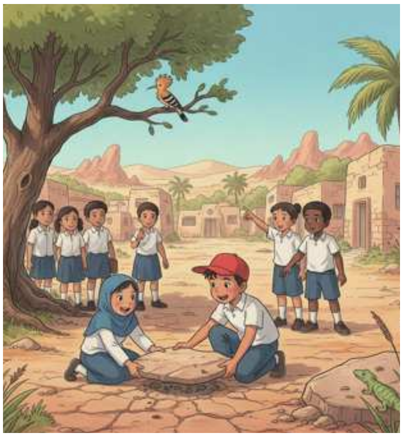
Even in hot and dry places like deserts, living organisms can live in the **shade of rocks** or **under the ground**.

Warm Up Living organisms exploration-where are they?

Let's look at the pictures and guess where the living organisms are.

❶ **Guess:**

Talk about where they might be.
(Examples: "Flower bed," "Roots of a big tree," "Gaps in rocks")



❷ **Search:**

Go outside and check the places you guessed.
If you find one, watch it quietly and carefully.

❸ **Note the place:**

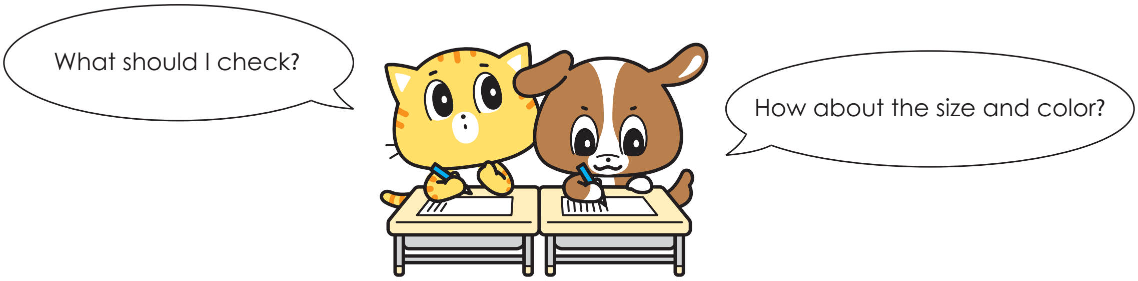
Write down not just the name, but also "what kind of place you found it in."

1-2

How to Observe

Chapter 1 ····· Nature in Our Surroundings

Let's check the shape and body of the living organisms we found closely.


What should I check?
How about the size and color?

Point! Rules for Observation

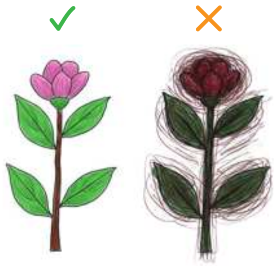
When you look closely at living organisms, pay attention to **shape**, **color**, and **size**.

magnifying glass

How to use a magnifying glass

- **When you CAN move the thing:**
  Hold the glass close to your **eye** and move the **thing** back and forth to focus.
- **When you CANNOT move the thing:**
  Hold the glass close to your **eye** and move your **face** back and forth to focus.
- **Caution:** Never look directly at the **sun** with a magnifying glass.
- Wear gloves to protect your hands from contamination.

How to write a Record Card



sketch

1. Write the **topic** first.
2. Write the **date and your name**.
3. Write what you found with a **sketch** and **sentences**.
   - Sketch:
     Draw with **thin**, **clear lines**. (Don't shade it in!)
   - Sentences:
     Write about the place, size, shape, and color.
4. Finally, write **what you learned** or what you wondered.

Warm Up Let's observe closely!

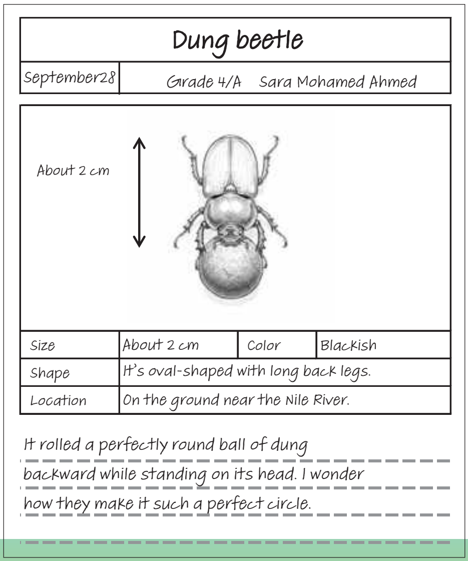
① **Let's use a magnifying glass.**

Insects: Look at small hairs or the joints of legs.

Plants: Look at the lines (veins) on the leaves.

② **Let's write a record card.**

→ Go to Page 100



Dung beetle

September28 Grade 4/A Sara Mohamed Ahmed

Size	About 2 cm	Color	Blackish
Shape	It's oval-shaped with long back legs.		
Location	On the ground near the Nile River.		

It rolled a perfectly round ball of dung backward while standing on its head. I wonder how they make it such a perfect circle.

Try

1 (1) Where do these living organisms often live? Choose the correct words from below to fill in the blanks.

① Grasshoppers are often in the (   ).

② Pill bugs are often in (   ) places like under stones.

③ Lizards are sometimes seen on sunny (   ).

damp / rocks / grass

(2) Fill in the blank about observation.

Living organisms live in (   ) that fit them. So, the kinds of living organisms you find are different depending on the location.

2 (1) Mark ✓ for correct statement about how to use a magnifying glass, and ✗ for the incorrect one.

① (   ) Hold the glass far from the eye and look around.

② (   ) When observing a tree that cannot move, move your own face to focus.

③ (   ) Look at the sun through the magnifying glass.

(2) Choose the correct way to sketch for science from below.

A: Add shadows to make it look cool.

B: Draw the shape exactly as you see it with thin lines.

C: If you can't see a part well, imagine it and draw it.

Exercise

1 (1) Where is it easy to find living organisms in a hot, dry place like Egypt? Choose all correct answers from below.

A: Right in the middle of the hot sand in the sun.

B: Cool places in the shadow of rocks or big stones.

C: At the roots where a little bit of grass grows.

(2) Choose the correct words from below to fill in the blanks.

<<Where living organisms are>>

- Near grass or trees: Places with (   ) or places easy to (   ).
- Under stones or shadows of rocks: Places with (   ) or cool places away from the sun.

dampness(water) / hide / food

2 (1) Mark ✓ for correct statement about how to use a glass, and ✗ for incorrect one.

① (   ) Held the glass close to the eye and looked at the sun.

② (   ) To look at a leaf in hand, held the glass to the eye and moved the leaf back and forth.

③ (   ) The object couldn't move, so held the glass far from the eye and stretched arms out.

(2) What is important to write on a record card besides the sketch? Choose 3 correct answers from below.

A: Date

B: Location found

C: What you ate for dinner yesterday

D: Color and shape of the living organism

E: Your favorite colors and shapes

1-3 Colors and Shapes of Living Organisms

Chapter 1 ····· *Nature in Our Surroundings*

Let's group the living organisms we found.

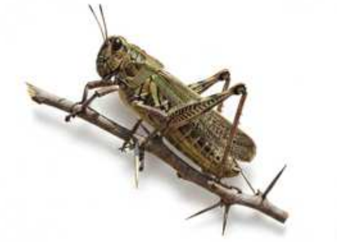
Point! How to Group (Classify)

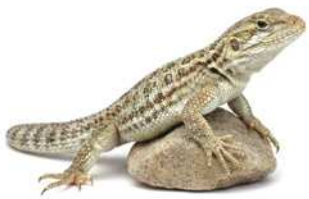
You can group things by looking at their **color** and **shape**.

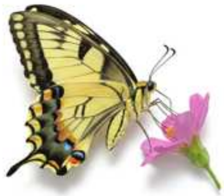
- **Find common points**:
  Look for things that are the same, like "has legs," "has wings," or "colors are similar".
- **Find differences:**
  Look for things that are not the same, like "shape is different" or "size is different."
- **Classify:**
  Collect things with similar features and put them in groups.

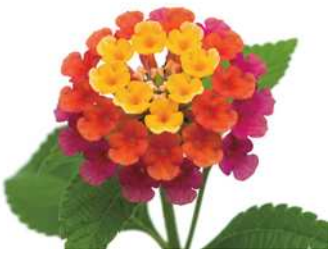
Warm Up Let's make groups!

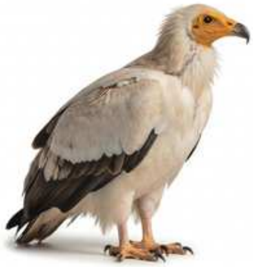
Let's group the living organisms in the photos in different ways.

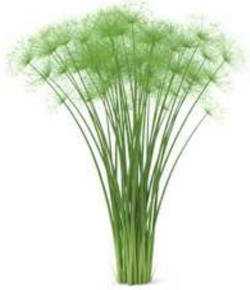


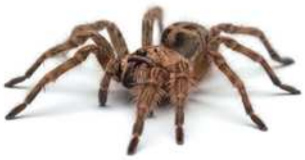


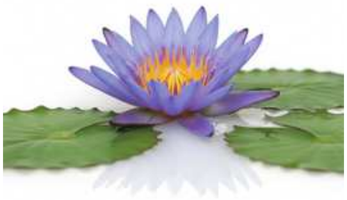












- **By Color:** Brown group, Green group, etc.
- **By Shape:** Group with 6 legs, Group with no legs, etc.
- **By Size:** Group bigger than a sparrow, Group smaller than a sparrow, etc.

Let's Expand!

• Animals

Hoopoe

Habitats: Gardens and farmlands

Sand Cat

Habitats: Deserts east of the Nile River

Cattle Egret

Habitats: The Nile River basin, farmlands and green areas

Plain Tiger

Habitats: The Nile Delta, valleys and city parks

Dung Beetle

Habitats: Deserts, grasslands and farmlands

Egyptian Cobra

Habitats: Dry semi-deserts, savannas and woodlands

Let's Expand!

• Plants

Palm Tree

Habitats: Deserts, oases and the Nile River basin

Lotus

Habitats: Wetlands and swamps of the Nile River

Colocynth

Habitats: Dry deserts near the Mediterranean Sea

Papyrus

Habitats: Swamps and watersides of the Nile Delta

Acacia

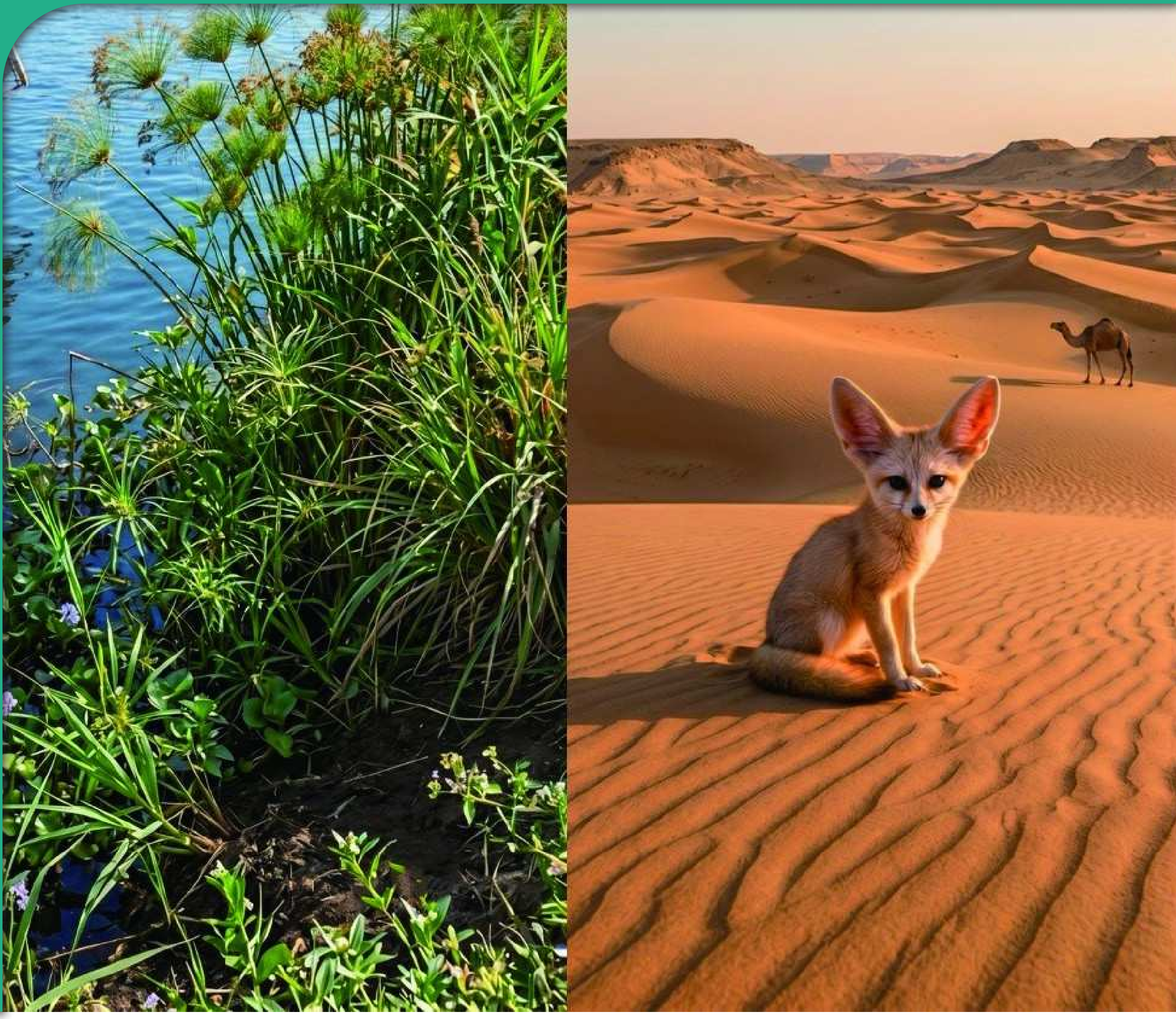
Habitats: Dry areas, deserts and around oases

Egyptian Clover

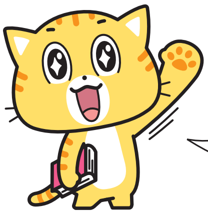
Habitats: Rich lands of the Nile Delta and Upper Egypt

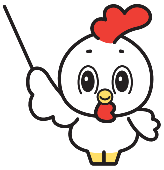
1-4 Different Places, Different Living Organisms

Chapter 1 ····· *Nature in Our Surroundings*



What is the difference between the living organisms found along the Nile River and in the desert?


Are there living organisms that want water near the river?


The kinds of living organisms that can live in a place depend on their habitat.

Point! The Connection between Habitats and Living Organisms

- The place where a living organism lives is called its **habitat**.
- Changing body parts or behaviors to survive in a place is called **adaptation**.
- Differences in Habitats

	Along the Nile River	Desert
Environment	Plenty of water, **moist** soil	Very little water, **dry** soil
Plants	Luffa, Orange, Lotus	Acacia, Colocynth
Animals	Frog, Bee, Water bird	Fennec fox, Jerboa, Lizard

- Desert plants (like the acacia) have small leaves so they don't lose water, and their roots grow deep underground.

▲Acacia

Warm Up Let's think about habitats!

Let's find the connection between the environment of a habitat and its living organisms!

❶ **Compare the environments:**
Look at the pictures of the Nile River and the desert, and compare the "amount of water" and "amount of sunlight" living organisms can use.

❷ **Predict:**
Discuss "What would happen if you took a frog from the Nile River to the desert?"

❸ **Summary:**
Let's summarize that living organisms need adaptation suited to their environment to live in that place.

Try

(1) What do you call the place where a living organism lives?

(2) Write A for living organisms found in the desert, and B for those found along the river from below.

① Egyptian sand lizard

② Water lily

③ Fennec fox

④ Papyrus

⑤ Jerboa

⑥ Egyptian goose

(3) What are the physical features of desert plants that help them keep water? Choose all correct answers from below.

A: The leaves are very big.

B: The leaves are small.

C: The roots grow shallowly underground.

D: The roots grow deep underground.

Exercise

(1) Choose the correct answer about the "color" and "shape" of living organisms from below.

A: The color and shape of living organisms are decided by how much they exercise.

B: The color and shape of living organisms are adaptations to survive in their habitat.

C: The color and shape of living organisms are caused by the differences in what they eat.

(2) Choose the correct answer about combination of a plant's "shape" and its habitat from below.

A: Desert plants have small leaves so they don't lose water.

B: Desert plants have very big leaves to absorb a lot of water.

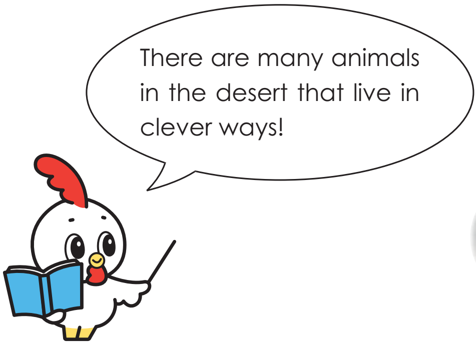
C: Desert plants have very big leaves to share water with animals.

(3) What do you think would happen if you took a frog living in the Nile River to the desert? Answer with your reason.

(4) What is it called when a living organism changes its body parts or behaviors to survive in a place?

1-5 Desert Living Organisms

How do living organisms live in the hot desert where there is little water?


There are many animals in the desert that live in clever ways!

Point! Body Styles to Survive the Desert

In the deserts of Egypt, living organisms have special body shapes and ways of living to match the harsh environment.

① Fennec Fox

- **Big ears:**
  They have the role of letting body heat **escape to the outside.**
- **Fur on the Soles of Feet:**
  Covered with thick fur so they do not get burned when walking on hot sand.

▼Fennec Fox

▼thick fur

② Jerboa

- **Long back legs:**
  They jump like a kangaroo to move quickly. This helps keep the time they touch the hot ground short.

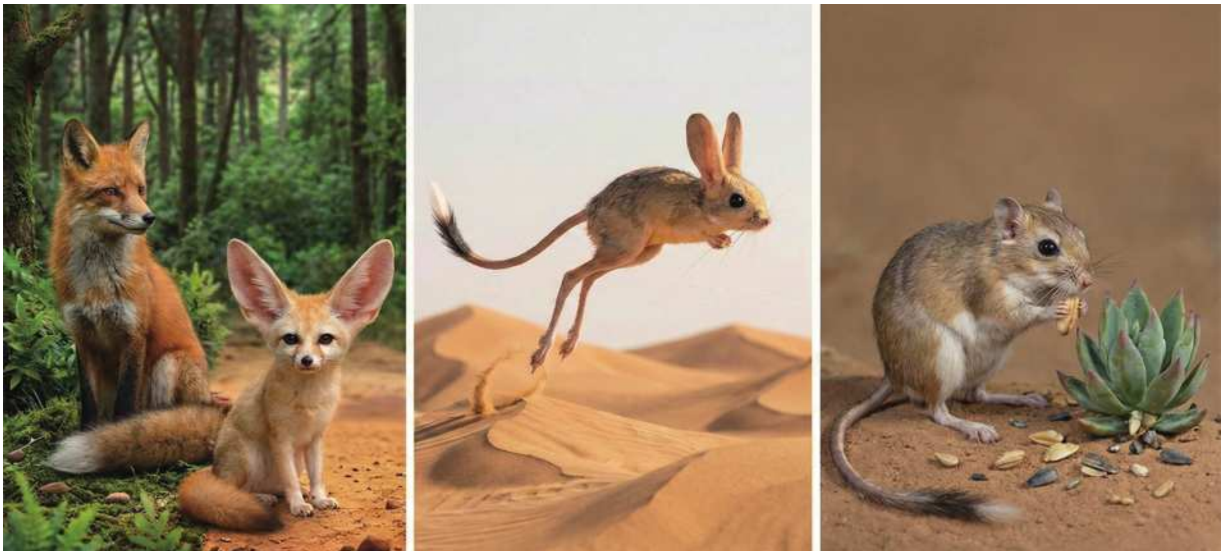
▼Jerboa

Clever Ways of Living:

- Many animals are active at night when the temperature goes down.
- During the day, they spend time in cool holes under the ground.

Warm Up Let's find the secrets of desert animals!

Look at photos or books and talk about how desert animals deal with the heat.



① **Compare the size of ears:**

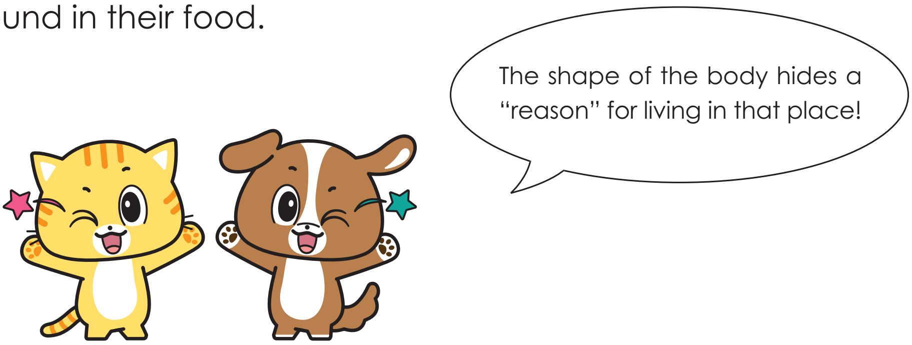
- Compare the "ear size" of animals living in forests with the Fennec fox living in the desert. Why are they different?

② **Look at the shape of legs:**

Why are the Jerboa's back legs so long? Let's imagine how it walks on the sand.

③ **How to drink water:**

- Camels drink a lot of water at once and store it inside their bodies.
- Some desert animals drink almost no water and can live only on the water found in their food.


The shape of the body hides a "reason" for living in that place!

Try

(1) Why are the Fennec fox's ears so big? Choose the correct answer from below.

A: To hear small sounds from far away well.

B: To let heat inside the body escape to the outside and keep the body cool.

C: To move the big ears like wings and fly in the sky.

(2) Why are animals living in the desert not very active during the day? Fill in the blanks with the correct words to explain the reason.

Because the sunlight is strong and it is very (①) during the day in the desert, animals often rest in cool (②) in the ground or in the shade of rocks.

Exercise

(1) Which of the following is NOT true about the features and life of desert living organisms?

A: Fennec foxes have fur on the soles of their feet to protect them from hot sand.

B: Mice in the desert often move around at night to avoid the heat.

C: Desert plants spread many big, thin leaves so they don't lose water.

(2) Fill in the blank about the body feature of the Jerboa.

The Jerboa uses its long ( ) to jump and move quickly avoiding the hot ground.

Chapter 1 Column: *The Desert Cleaner, "Scarab"*

The Wonder of Living Organisms

The True Identity of the Bug Loved by Ancient Egypt

In the history of Egypt, the most famous insect is the scarab (dung beetle). Ancient Egyptian people treated this bug with great care as a "holy creature that carries the sun". But, if you look at them through the eyes of science, they have an even more amazing role!

1 Scarabs are "Guardians of the Environment"

Scarabs roll animal dung into balls, carry them, and bury them in the soil. At first glance, it might look like a slightly dirty job, but this is a very important "cleanup" for nature.

- **Making the soil rich:**

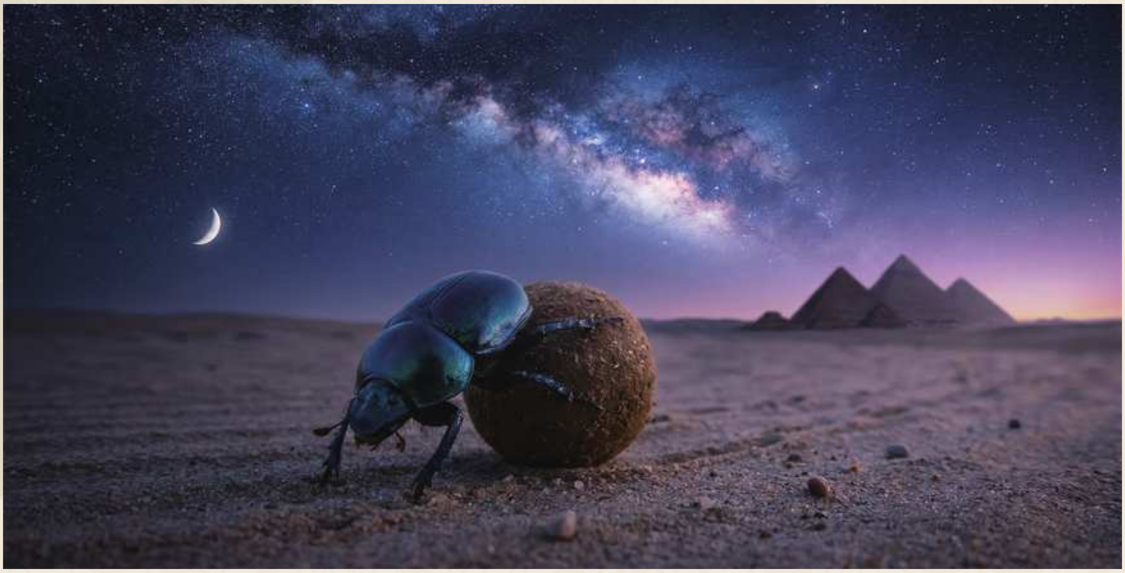
  By burying dung in the dirt, they deliver nutrients (plant food) to the soil so plants can grow.

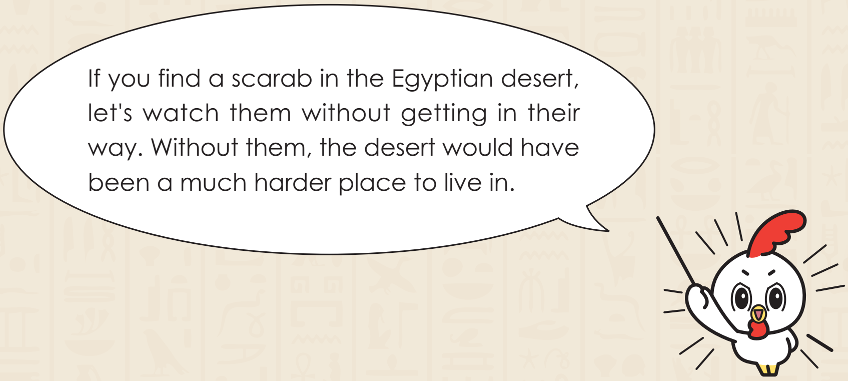
- **Preventing sickness:**

  They stop sickness from spreading from leftover dung.

2 The Amazing Ability of Scarabs

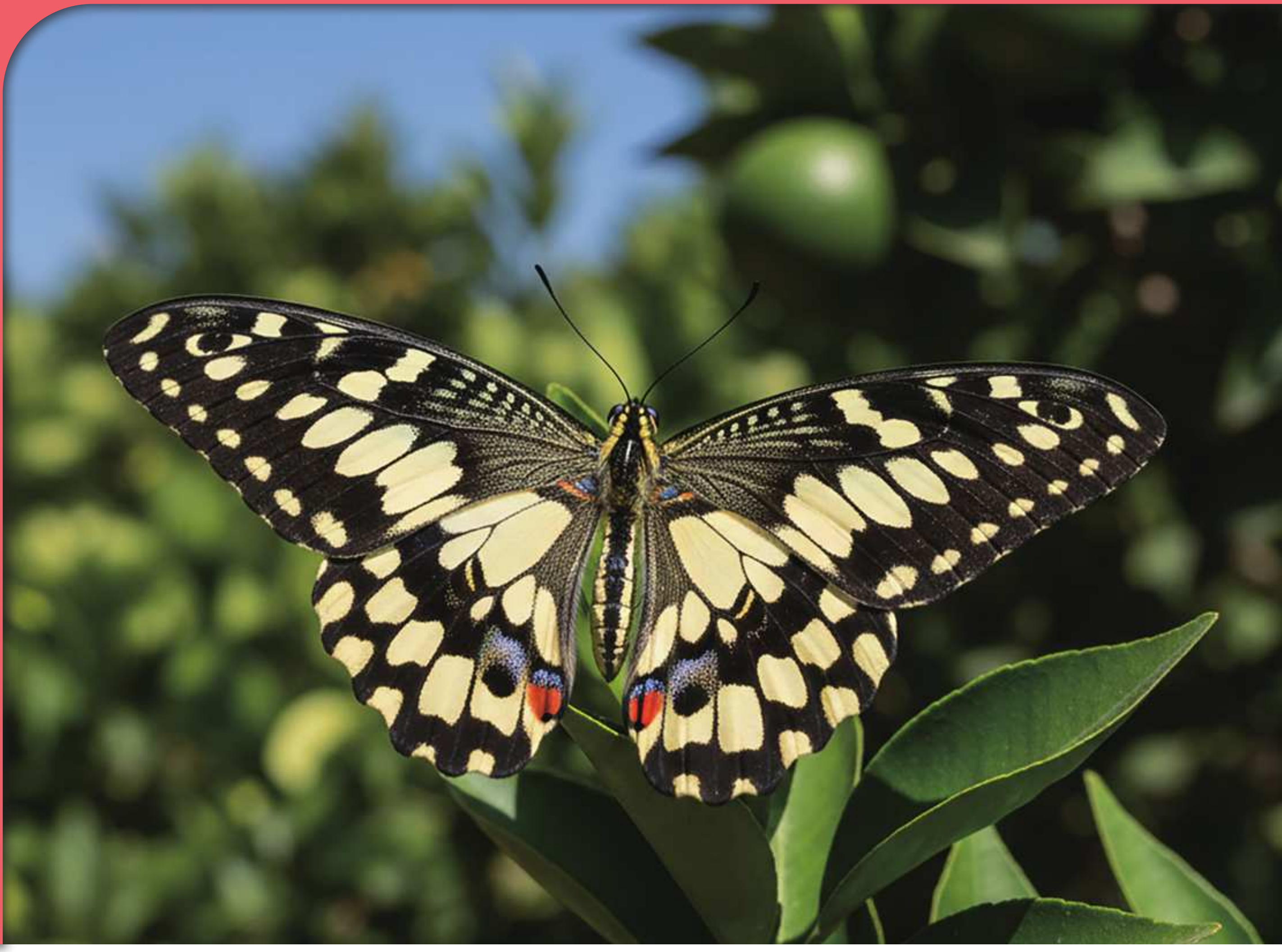
Recent studies have found that when scarabs roll dung, they are actually looking at the "stars". At night, they use the light of the Milky Way as a guide to carry it straight to where they want to go. Inside their small bodies, they have a super smart navigator that feels the universe!



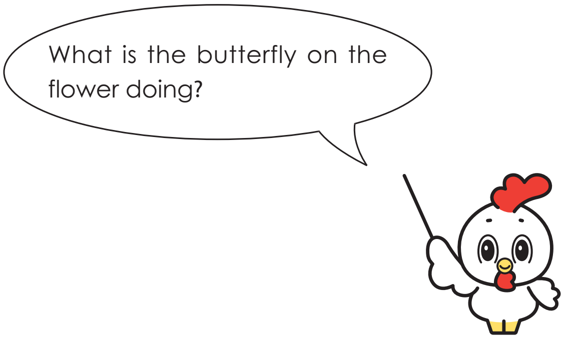

If you find a scarab in the Egyptian desert, let's watch them without getting in their way. Without them, the desert would have been a much harder place to live in.

2-1 Eggs and Larvae

Chapter 2 ····· How Insects Grow



How do insects start their lives?


What is the butterfly on the flower doing?

Point! The Beginning and Growth of Insects

Many insects are born from eggs.

- The place, shape, and color of eggs are different for each insect. Many are laid on the underside of leaves.

Larva:

The baby insect that just came out of the egg. A newborn larva eats a lot of food and grows.

- When a larva eats and gets bigger, it takes off its skin. This is called **molting** (shedding skin). It does this many times to grow larger.

Warm Up Let's look for eggs and larvae!

Let's observe where insects (like butterflies) lay their eggs.

① **Look at the underside of leaves:**

Use a magnifying glass to look under the leaves.
(Butterflies know which plants their babies eat)

② **Record what the larva looks like:**

Look at the larva's color and where it is eating. Looking for "eating marks" (holes in leaves) helps you find them.

③ **Measure the size:**

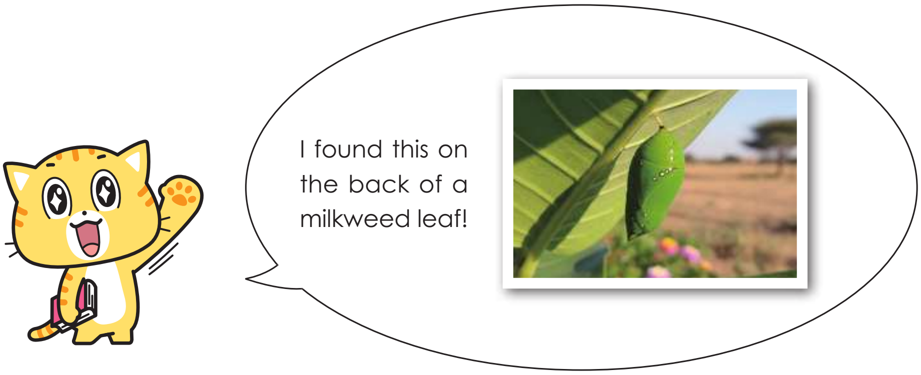
Use a ruler to see how big the larva has grown. Keep a record.

2-2

Pupae and Adults

Chapter 2 ····· How Insects Grow

How does a butterfly grow from a larva?


I found this on the back of a milkweed leaf!

Point! Changing Shapes as They Grow

Butterflies grow in this order:

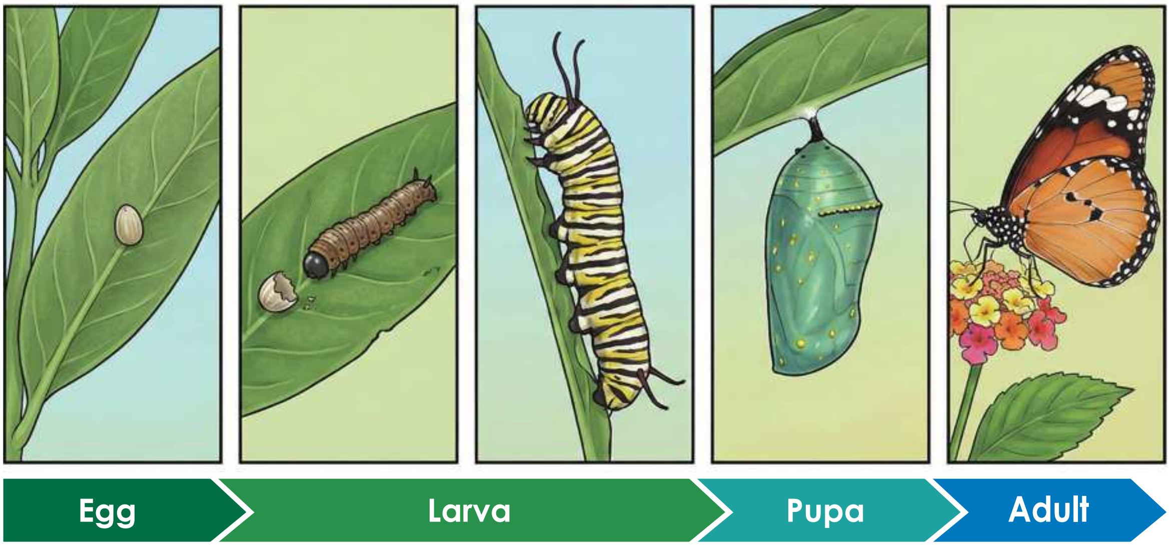
Egg → **Larva** → **Pupa** → **Adult**. Dung beetles and bees are also in this group.

- **Pupa**:

  It does not move, so it looks like it is resting. But inside, its body is changing from a child to an adult.

- **Adult:**

  The fully grown form. It lays eggs to connect to new life.



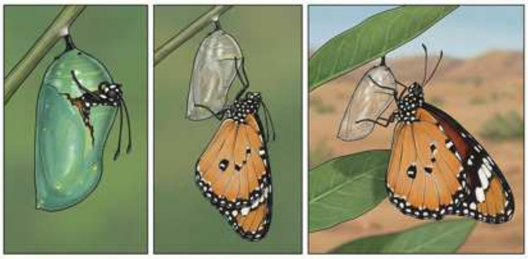
Warm Up Let's observe a pupa!

Let's watch a larva become a pupa and come out as an adult.

❶ **Where it becomes a pupa:**
When the larva stops eating, watch where it goes to become a pupa.

❷ **Pupa details:**
Draw the shape and color of the pupa.
(Let's write on the record card.)

❸ **To an adult:**
When the adult comes out, the back splits open first. The wings are wrinkled at first, but they stretch out after a while.



Try

1 (1) Choose the correct words from below to fill in the blanks.

- Butterflies are born from (①).
- The baby that just came out of the egg is called a (②).

Adults / Larva / Eggs

(2) Choose the correct answer about larvae growth from below.

A: Larvae grow bigger and bigger even if they do not eat food.

B: Larvae grow bigger by shedding their skin many times.

C: Larvae have the same body shape as adults from the moment they hatch from eggs.

2 (1) Fill in the blank with the correct word.

Butterfly growth:

Egg → Larva → ( ) → Adult

(2) Choose the correct answer about the pupa stage from below.

A: Inside the body, it is preparing to change into an adult.

B: During this stage, it eats even more leaves than when it was a larva.

C: The pupa keeps moving around in this form for the rest of its life.

Exercise

1 (1) Where do butterflies lay eggs the most? Choose the correct answer from below.

A: On top of dry sand

B: On the underside of the leaves of plants that larvae eat

C: At the tip of a tree branch in a high, windy place

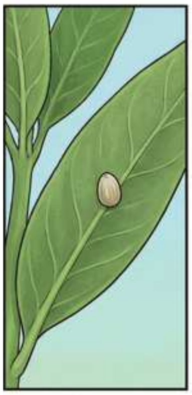
(2) What do we call it when a larva takes off its skin?

2 (1) How does a butterfly grow from an egg?

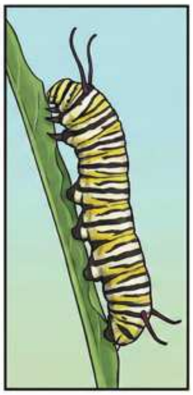
Put the pictures in the correct order (A to E).

A (**Egg**) → (   ) → (   ) → (   ) → (   )

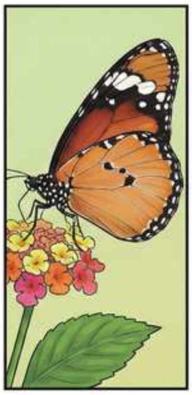
A



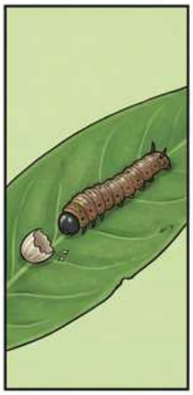
B



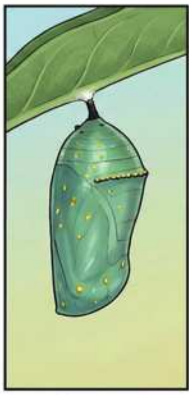
C



D



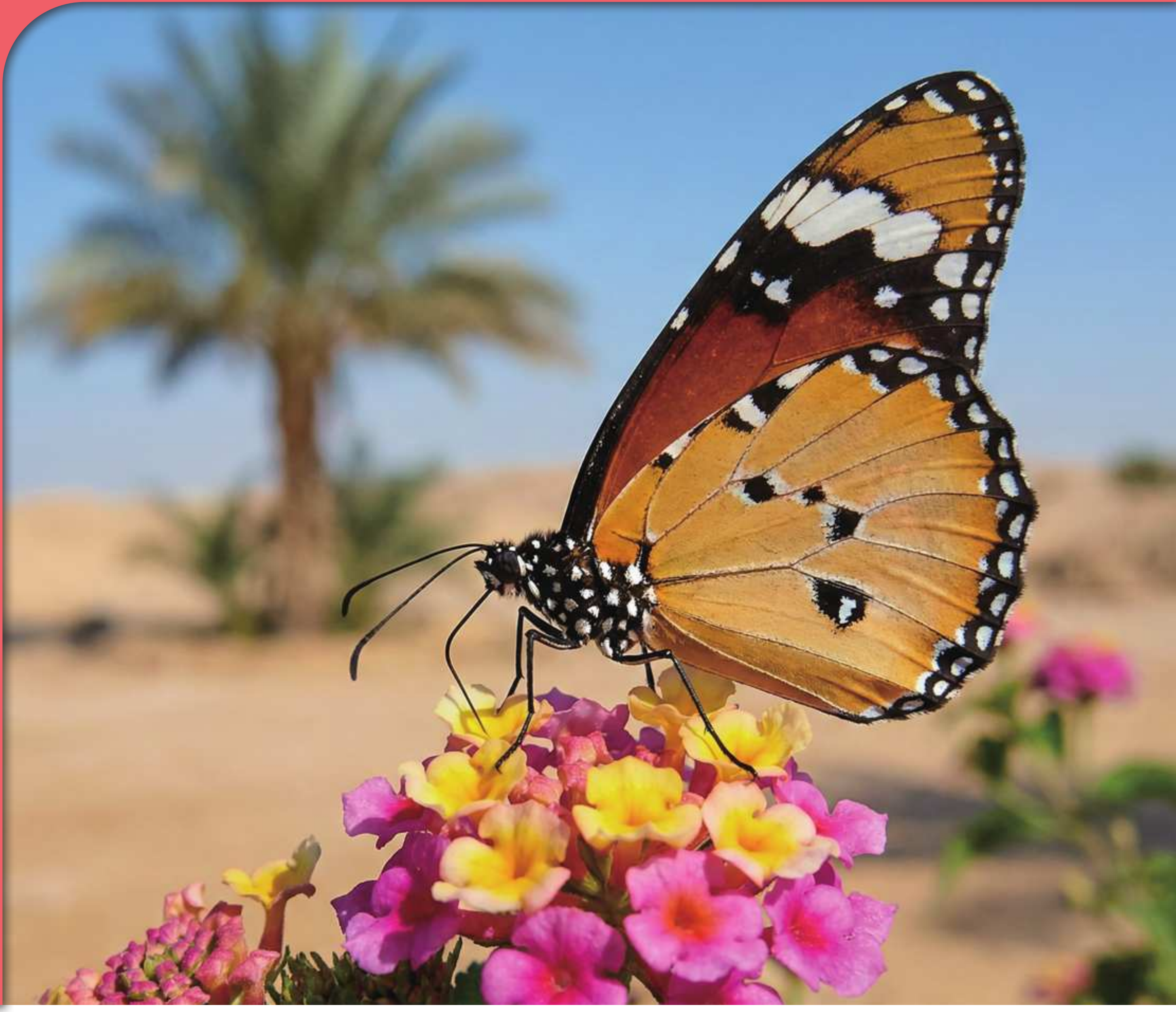
E



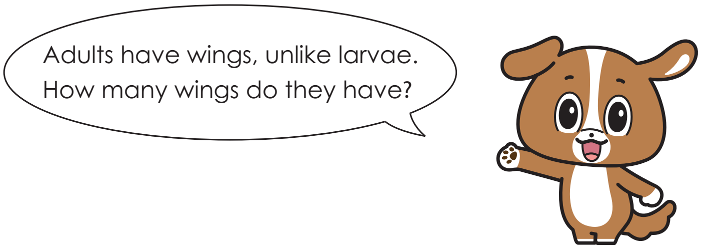
(2) What is the state shown in picture E called?

2-3 Body Structure of Adults

Chapter 2 ····· How Insects Grow



What is the body of an adult butterfly like?

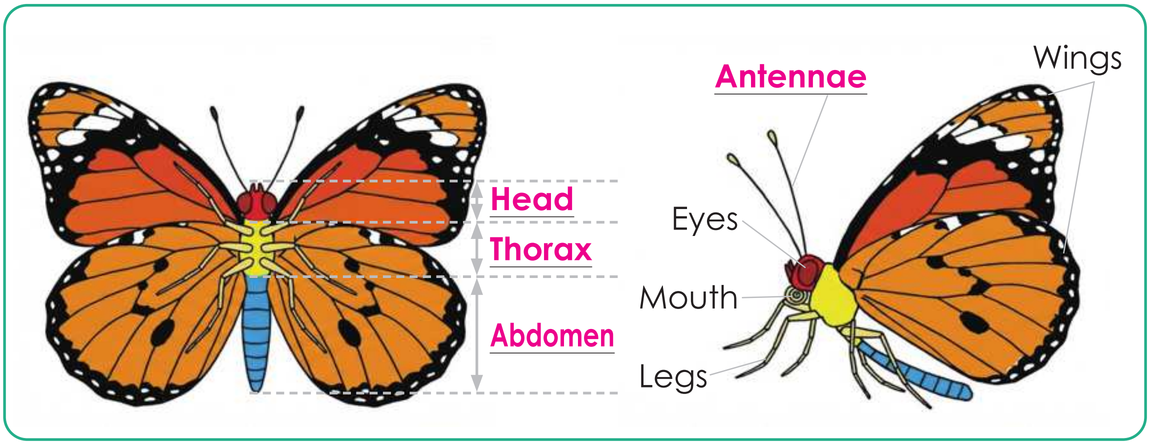


Adults have wings, unlike larvae.
How many wings do they have?

Point! Body Structure of Adults

The body of an adult butterfly:

- It is made of 3 parts: **Head**, **Thorax**, and **Abdomen**.
- There are **6 legs**, and they are all on the **Thorax**.
- On the Head, there are eyes, a mouth, and 1 pair of **antennae** (2 of them).



Animals with this body structure are called **Insects**.
Dragonflies, grasshoppers, and dung beetles are also insects.

Warm Up Let's observe insect bodies!

Look at grasshoppers, butterflies, and ants to find what is the same.

1. **Separate the parts:**

   See where the body is divided.

2. **Check where legs are attached:**

   Use a magnifying glass to check which part the legs come from.

3. **Compare with other animals:**

   Are spiders and pill bugs built the same way as insects? Count their legs.

Try

(1) Name the parts of the insect's body.

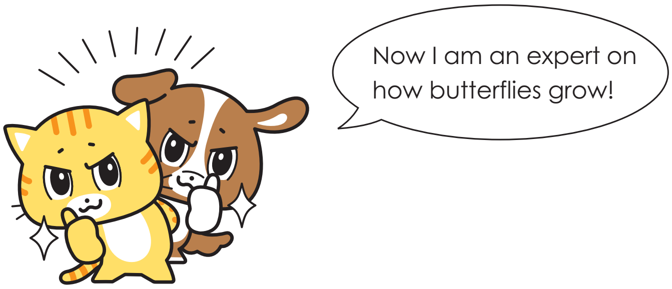
(2) What do we call the long, rod-like parts on an insect’s head?

Exercise

(1) Fill in the blanks with the correct words to explain the butterfly’s body.

- Some adult butterflies’ bodies are made of ( ) · ( ) · ( )
- On the Thorax, there are ( ) legs and ( ) wings.

(2) What do we call the group of animals that have a body structure like butterflies, grasshoppers, and dung beetles?

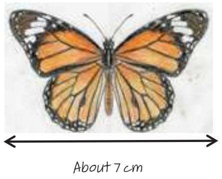

Now I am an expert on how butterflies grow!

Summary

Let's look back and summarize what we have learned!

→ Go to Page 100

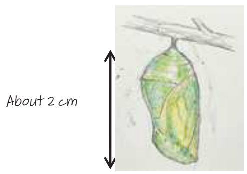
African Monarch			
October10	Grade 4/A Ali Hassan Zaki		



Size	About 7 cm	Color	Orange and brown
Shape	• It has a head, thorax, and abdomen. • 6 legs • 4 wings		
Location	A park near the school		

It was sucking nectar from flowers.
I realized that its body structure was completely
different from that of a larva.

African Monarch(Chrysalis)			
October3	Grade 4/B Sarah Mahmoud Ibrahim		



Size	About 2 cm	Color	Green
Shape	• Chunky, sleek oval shape		
Location	Milkweed stems		

It was a vibrant green, sometimes appearing gold.
I wonder if the pupa will not be blown away
even if the wind blows.

Let's summarize it on the record card!

Let's Expand!

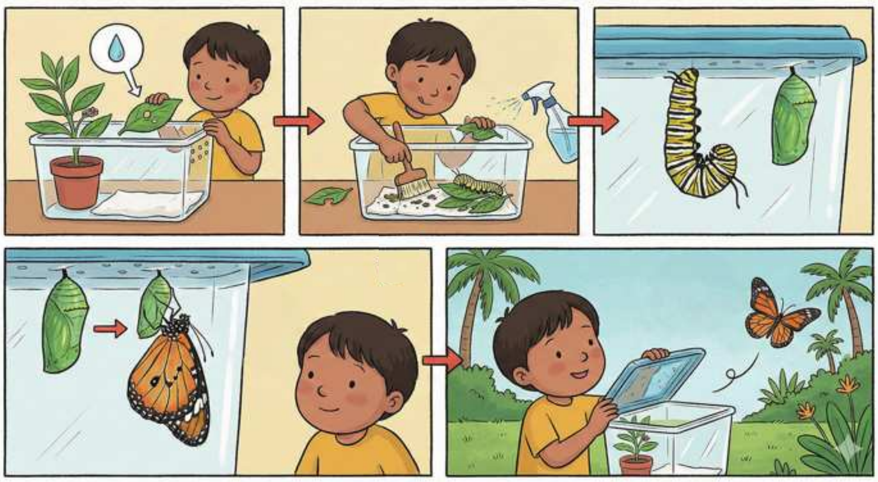
Let's Raise Butterflies from Eggs

1 Preparation:
Get a clear case that is easy to see through and has good air flow.

2 Daily Care:
- Clean up the poop often with a brush to keep it clean.
- Always give them fresh leaves (specific plants they eat, like milkweed).
- Keep the leaves from drying out so the larvae can shed their skin easily.

3 Pupa Time:
- When they start getting ready to become a pupa, watch them quietly.

4 To an Adult:
- Wait for the wings to harden.
- When the wings are dry and the butterfly moves well, let it go outside.

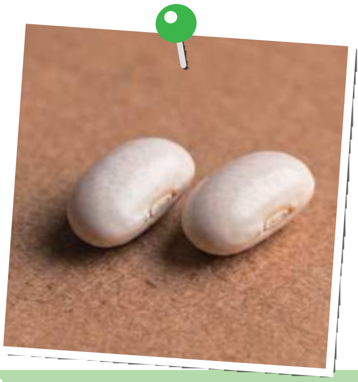


3-1

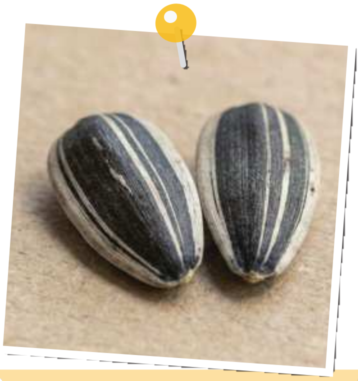
Sowing Seeds

Chapter 3 ····· How Plants Grow

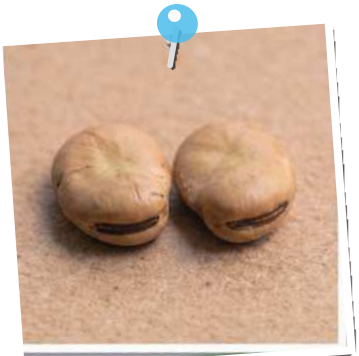
Let's look at seeds of different plants.



Bean



Sunflower



Fava bean

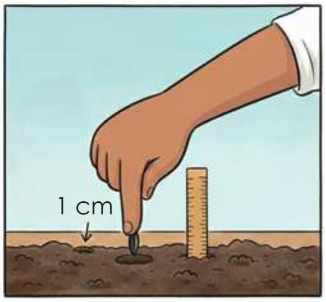
Point! The Beginning of Plants

Most plants start growing from seeds.

- **Shape and color of seeds:**
  Seeds come in many different shapes, colors, and sizes depending on the type of plant.

Sowing Seeds

- **Timing:**
  The best time to sow seeds depends on the plant.
  (Example: Sunflower: March - April
  Fava bean: October - November)



- **How to sow:**
  ❶ Make a hole about **1 cm** deep in the soil with your finger.
  ❷ Put the seed in it. Gently cover it with soil.
  ❸ After that, give it plenty of **water**.

Warm Up Let's check the shape, color, and size!

Use a magnifying glass to look closely at seeds like sunflower, fava bean, and chickpea.

❶ **Check the shape, color, and size:**

- Look for features like "round," "long and thin," or "striped."
- Measure the length.

❷ **Write on a record card:**

Write down what you observed on the card.

❸ **Sow the seeds of the plant you want to grow.**

3-2 After Sprouting

Chapter 3 ····· How Plants Grow

How do plants grow after the sprouts come out?

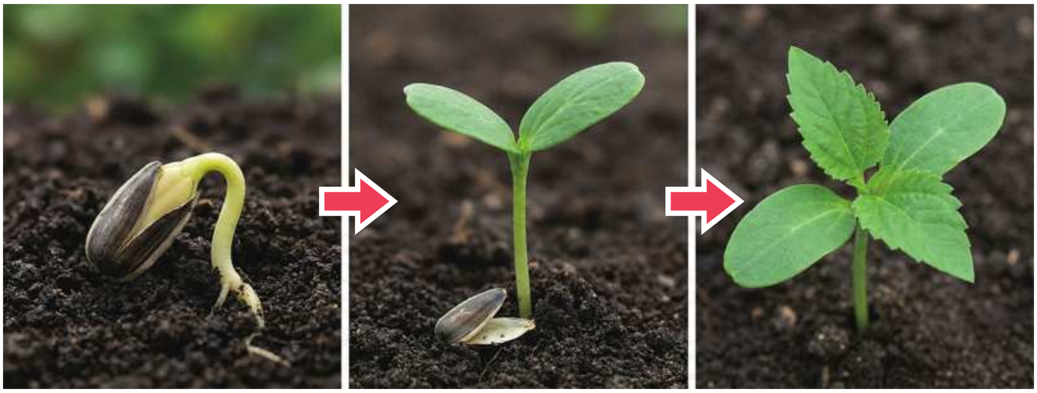
I wonder how they grow from small seeds.

Point! Growth After Sprouting

After you sow seeds and wait for a while, sprouts will come out.

- **Seed leaves (cotyledons)** :
  The first leaves you see after the sprout comes out. Plants like sunflowers and balsam have **two** seed leaves.
- **True leaves:** The leaves that come out after the seed leaves. They often have a different shape and color from the seed leaves. The number of leaves will increase little by little.
- **Plant height:** The height from the ground to the very top of the plant.

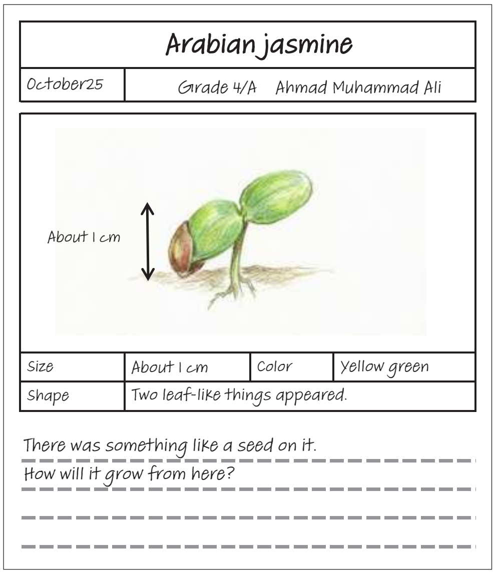
▼Sunflower sprouting



Warm Up Let's observe and record the sprout!

Use a magnifying glass to look closely at the plant after it sprouts.

1. **Compare the leaves:**
   Compare the "shape," "color," and "feel" of the first seed leaves and the true leaves that came out later.
2. **Sketch (draw a picture).**
3. **Measure the height:**
   Measure the "Plant Height" to the tip of the stem. Use a ruler or paper tape to measure from the ground to the base of the top leaf.
4. **Write a record card.**



Arabian jasmine

October25	Grade 4/A Ahmad Muhammad Ali

Size	About 1 cm	Color	Yellow green
Shape	Two leaf-like things appeared.		

There was something like a seed on it.
How will it grow from here?

Try

1 (1) Match the plant with the correct description of its seed.

① Chickpea •

② Sunflower •

• **A:** large and has black and white stripes.

• **B:** small and light yellow.

(2) What is the first important thing to do after you cover the seeds with soil?

2 (1) Fill in the blanks with the correct words about sprouting.

When a plant sprouts, the first leaves are called (①), and the leaves that come out after that are called (②).

(2) Choose the correct answer about sunflower leaves from below.

A: Seed leaves and true leaves are exactly the same shape.

B: Seed leaves are round, but true leaves have jagged edges.

C: Seed leaves come out after true leaves, from the bottom of the stem.

Exercise

1 (1) Choose all correct answers about how to observe seeds from below.

A: Use a magnifying glass to look closely at the surface.

B: Use a ruler to measure the size of one seed.

C: If you don’t know the shape well, sketch it in any shape you like.

(2) Choose the incorrect statement about how to sow seeds from below.

A: Make a hole with your finger in the soil, then put the seed in.

B: Pile up the soil very high like a mountain over the seed.

C: Give plenty of water after sowing the seeds.

2 (1) When measuring plant height, where should you measure from and to? Choose the correct answer from below.

A: The width of the leaf.

B: From the ground to the base of the top leaf.

C: From the tip of the root to where the seed was.

(2) Choose all correct answers that are good to write in an observation record (sketch) from below.

A: Shape and color of seed leaves and true leaves.

B: Color of the soil.

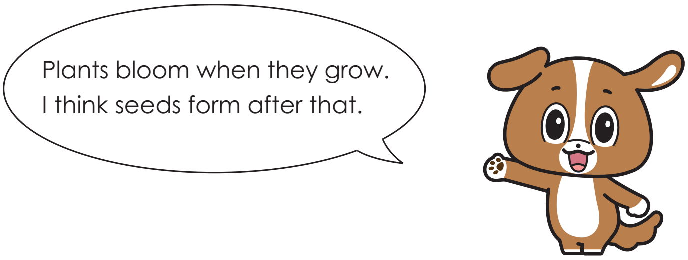
C: Plant height.

D: Your breakfast menu for that day.

Flowers and Fruits

Chapter 3 ····· How Plants Grow

How do plants change after flowers bloom?

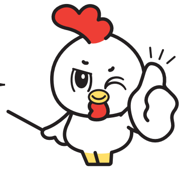

Plants bloom when they grow.
I think seeds form after that.

Point! From Flower to Fruit, then to Seed

❗ When plants grow big, they make **buds**, bloom **flowers**, and then make **fruits**.

- **After the flower:** After the flower withers (dries up), the base part swells up and becomes a **fruit**.
- **Inside the fruit:** When the fruit ripens, **new seeds** are made inside it.

❗ When the new seeds fall to the ground, sprouts come out again the next year and grow. This is how plants connect life to the next generation.



Blooming flowers is an important preparation to make "seeds" for the next generation!

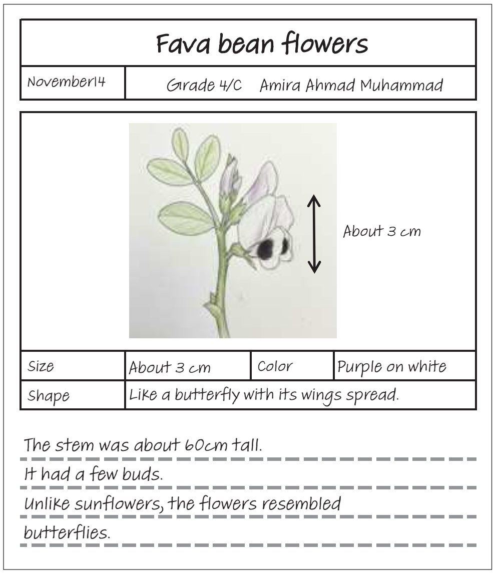
Warm Up Let's investigate changes after flowering!

Observe the flowers of sunflowers or fava beans, and look at what happens after they bloom.

① Observe the flower:

- Check the color, shape, and size of the flower.
- Check the size of leaves and plant height.

→ Write a record card.



Fava bean flowers

November14 | Grade 4/C Amira Ahmad Muhammad

Size	About 3 cm	Color	Purple on white
Shape	Like a butterfly with its wings spread.		

The stem was about 60cm tall.
It had a few buds.
Unlike sunflowers, the flowers resembled butterflies.

② Look at the flower after it withers:

Use a magnifying glass to see which part is getting bigger.

③ Check inside the fruit:

- When the fruit is dry, break it open to see what is inside.
- Let's count how many seeds are in one fruit.

I found that a single sunflower produces many, many seeds!

Try

(1) Fill in the blanks with the correct words to show the order of how plants grow.

Sow seeds → Sprout comes out → Stems and leaves grow → Buds form
→ (①) blooms → (②) is made → New seeds are made

(2) Choose the correct answer about changes after a flower blooms from below.

A: After a flower blooms, it just withers and nothing remains.

B: After a flower blooms, the base swells up and a fruit is made.

C: The fruit is already inside the bud before the flower blooms.

Exercise

(1) Which of the following is NOT true about how sunflowers grow?

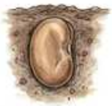
A: Many seeds are made after the flower blooms.

B: After making seeds and withering, life is passed on to the next generation.

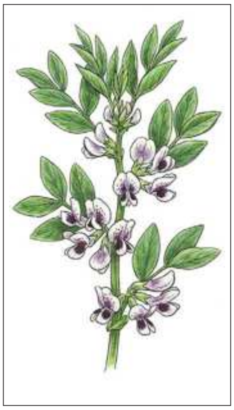
C: Only one new seed is always made from one flower.

(2) How does a fava bean grow from a seed?

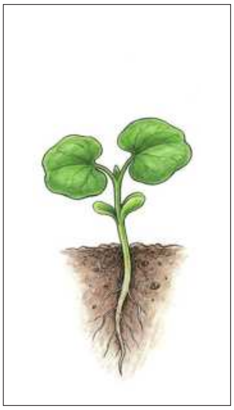
Put the pictures in the correct order (A to D).



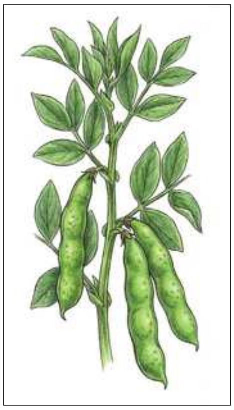
A



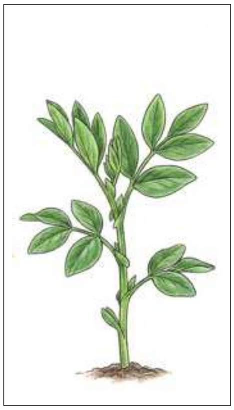
B



C



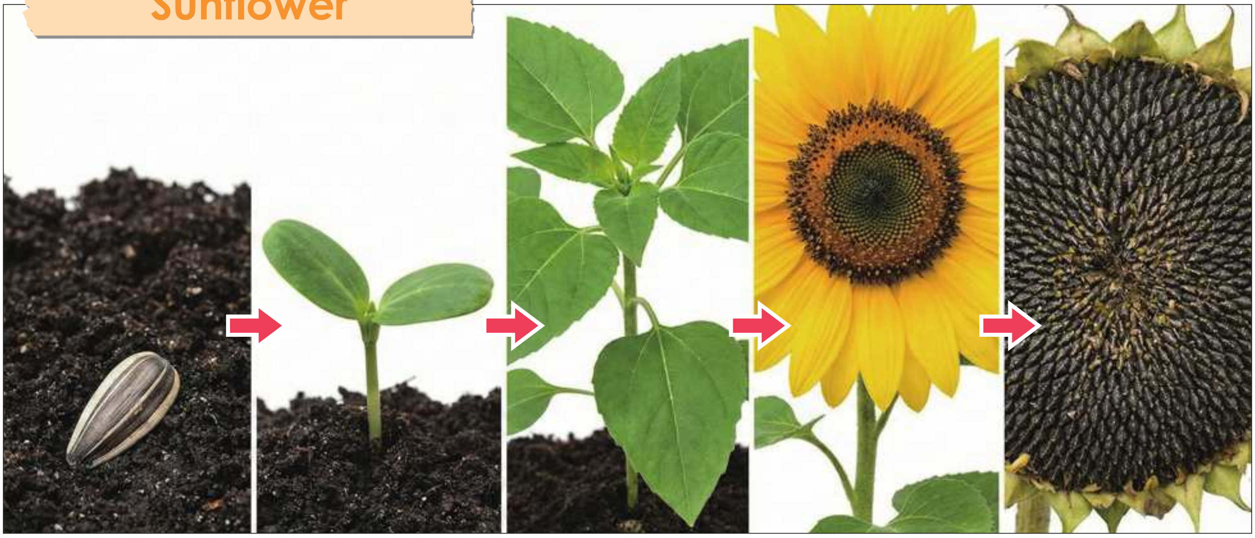
D



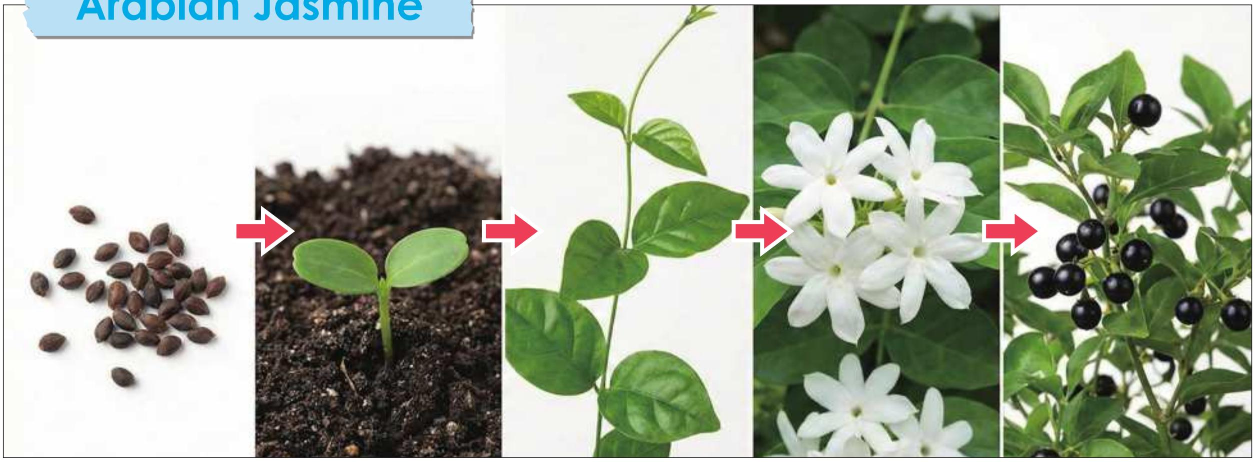
( ) → ( ) → ( ) → ( )

Let's Expand!

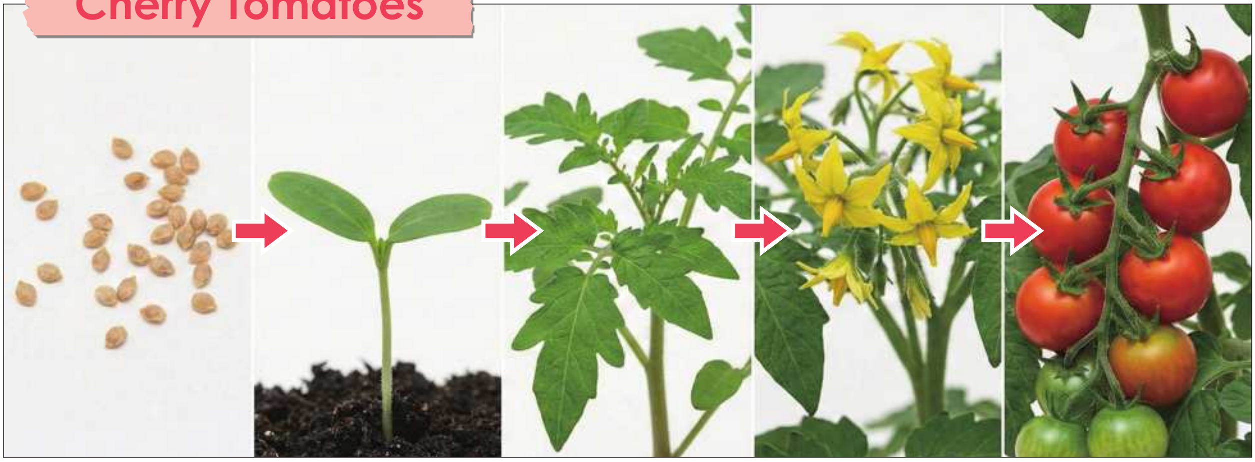
Sunflower



Arabian Jasmine



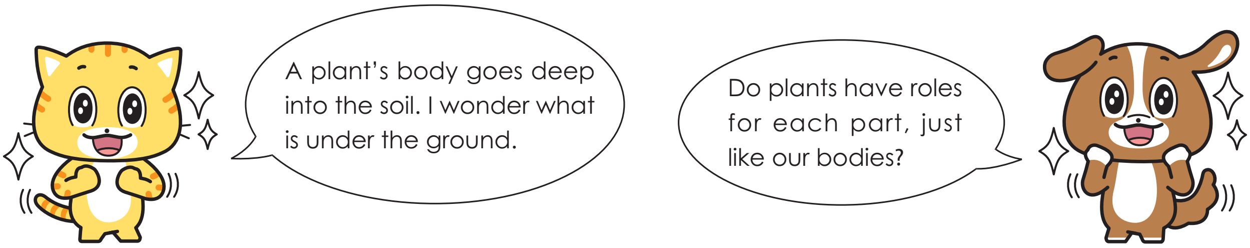
Cherry Tomatoes



3-4 The Plant Body

Chapter 3 ····· How Plants Grow

How is the body of a plant made?

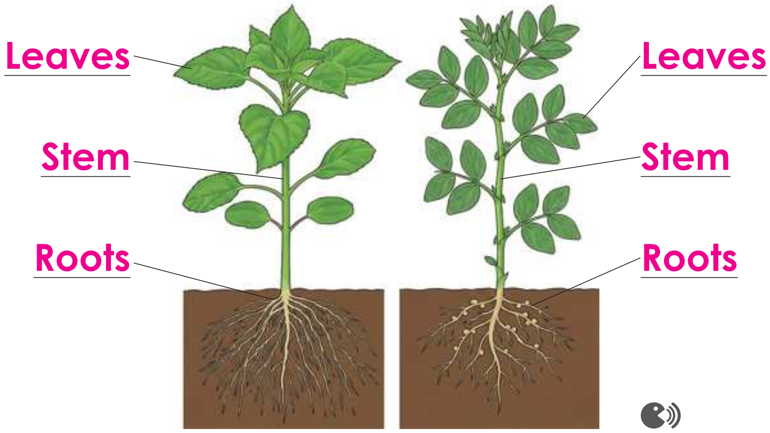

A plant's body goes deep into the soil. I wonder what is under the ground.
Do plants have roles for each part, just like our bodies?

Point! The Plant Body

A plant's body is made up of three main parts.

- **Roots**: They spread under the ground and **hold the plant firmly in the soil**. They also have the job of **sucking up water** from the soil.
- **Stem**: It supports the plant's body. It becomes a "**pathway**" to carry the water sucked up by the roots to **the leaves and flowers**.
- **Leaves**: They have a wide and flat shape to catch lots of sunlight.

▼Sunflower ▼Fava Bean



Warm Up Let's observe the plant body!

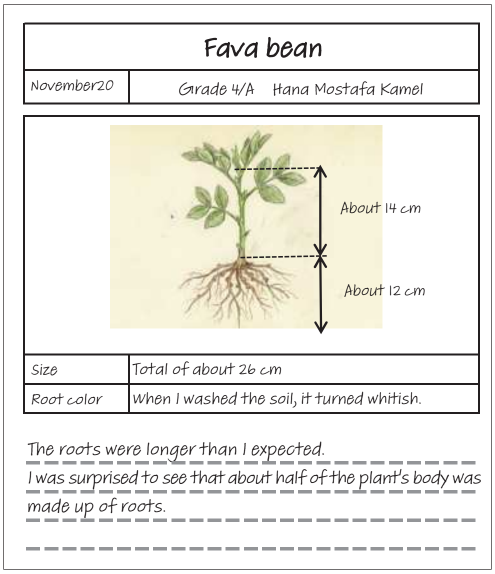
Let's observe plants like sunflowers and fava beans to check how their bodies are made.

❶ **Preparation:** Take the plant out of the pot. Gently wash the soil off the roots with water.

❷ **Observe the whole plant:**
- Look at where the leaves come out and how the stem grows.
- Let's also see how the roots spread out.

❸ **Write a record card:**
- When you sketch (draw), pay attention to how the roots, stem, and leaves connect. Draw the whole plant.

❹ **After observing:**
- Plant it in a flowerbed or a large pot.


About 14 cm
About 12 cm

Fava bean

November20	Grade 4/A Hana Mostafa Kamel
Size	Total of about 26 cm
Root color	When I washed the soil, it turned whitish.

The roots were longer than I expected.
I was surprised to see that about half of the plant's body was made up of roots.

Try

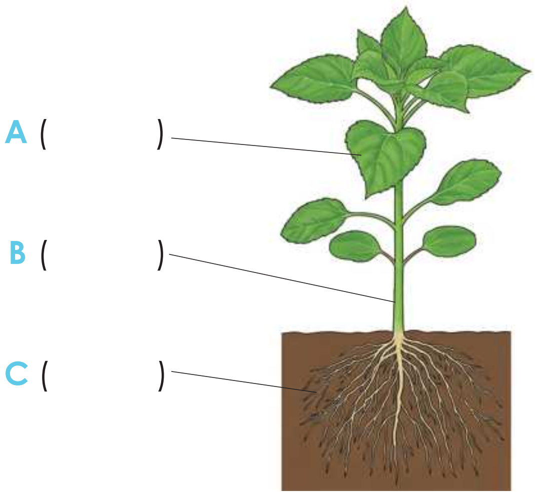
(1) Answer the names of the plant parts that do the following.

① It has a flat shape and catches sunlight. (   )

② It supports the body and is a pathway for water. (   )

③ It is under the ground and supports the body. (   )

(2) Fill in the blanks with the correct names for parts **A**, **B**, and **C**.



(3) Choose the correct answer about the role of roots from below.

A: To bloom beautiful flowers.

B: To hold the body firmly in the ground and suck up water.

C: To throw seeds far away.

Exercise

(1) Choose all correct answers that explain the plant body from below.

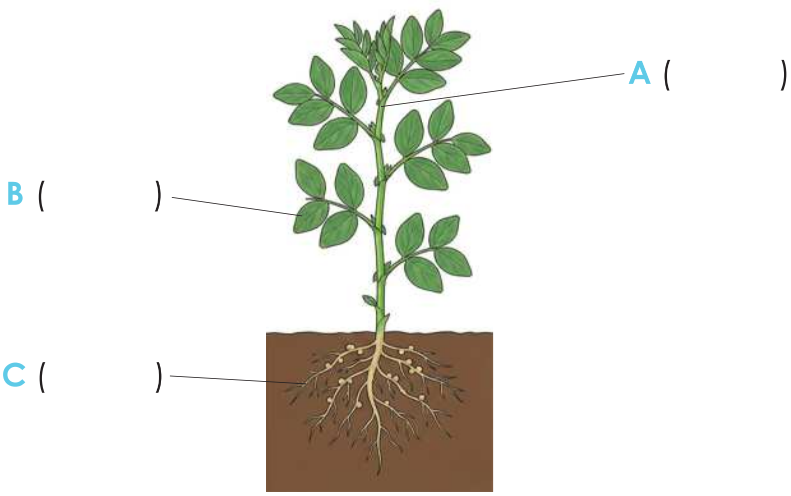
A: Both sunflowers and fava beans have bodies divided into roots, stems, and leaves.

B: Every plant always has only one leaf.

C: The stem becomes a pathway for water sucked up from the ground.

D: Roots have a flat shape to catch sunlight.

(2) Fill in the blanks with the correct names for parts **A**, **B**, and **C**.

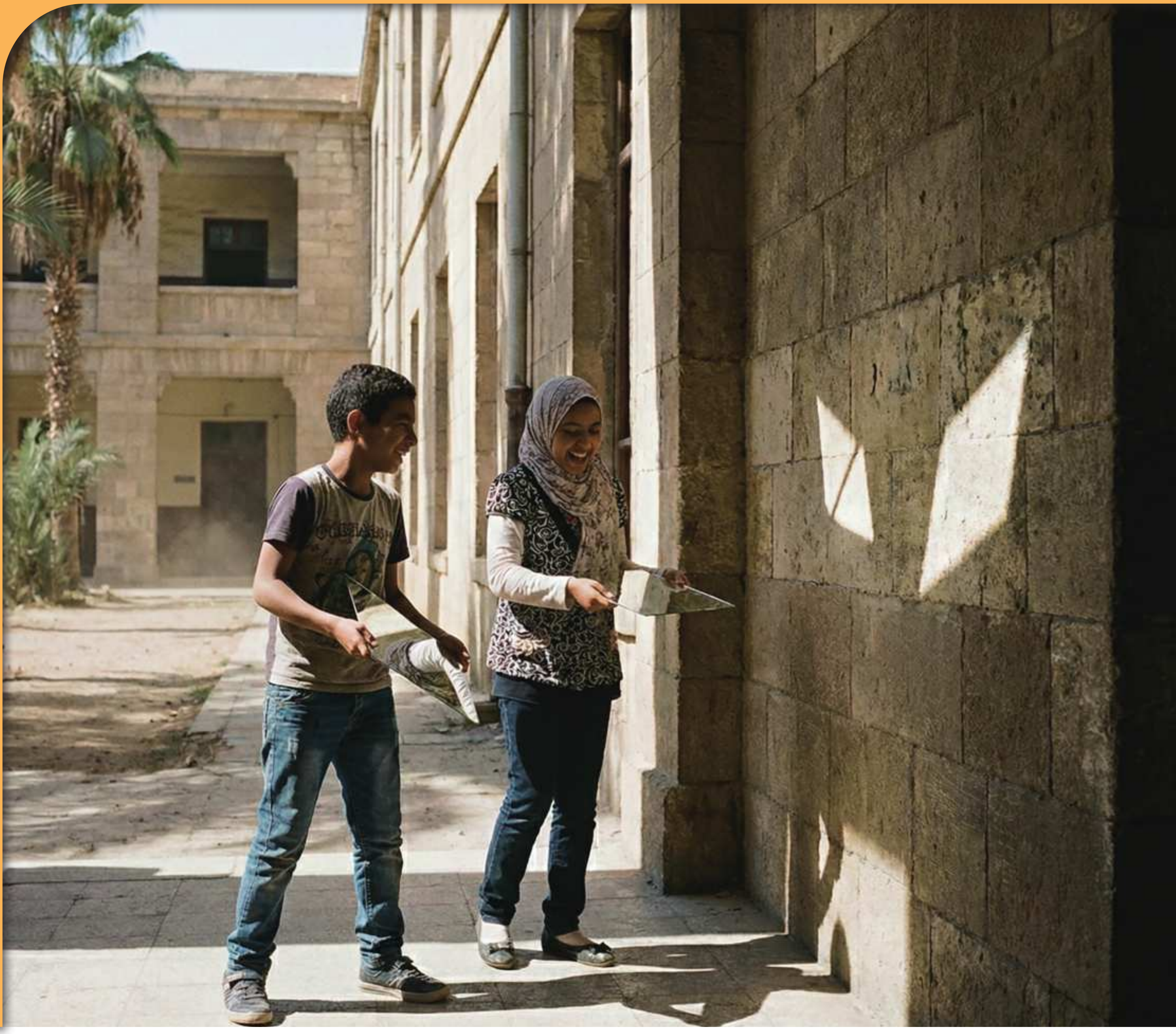


(3) Fill in the blanks with the correct words to complete the sentence.

Plants spread their (①) to catch lots of sunlight, and spread their (②) in the ground to take in water from the soil.

4-1 How Sunlight Travels

Chapter 4 ····· Properties of Light



How does sunlight travel when it bounces off a mirror?

Using a mirror, we can send light to dark places!

Point! How Light Bounces and Travels

Objects that emit their own light, such as the Sun and lamps, are called light sources.

Reflection: When light hits an object (like a mirror) and bounces back.

How Light Travels:

Sunlight travels **straight** as long as nothing blocks it.

Light reflected by a mirror also travels **straight**.

Warm Up Let's try a light relay!

3

Let's use a mirror to send sunlight to a place you like.

❶ **Hit the Target:**

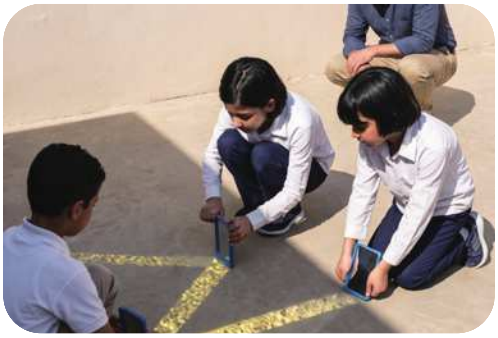
Bounce the sunlight with a mirror and try to hit a target in the shade.

❷ **See the Path:**

Sprinkle some powder or spray some water mist where the light passes. You will see the path of light faintly.

❸ **Relay:**

Use a second and third mirror to bounce the light even further. Does it keep going straight?

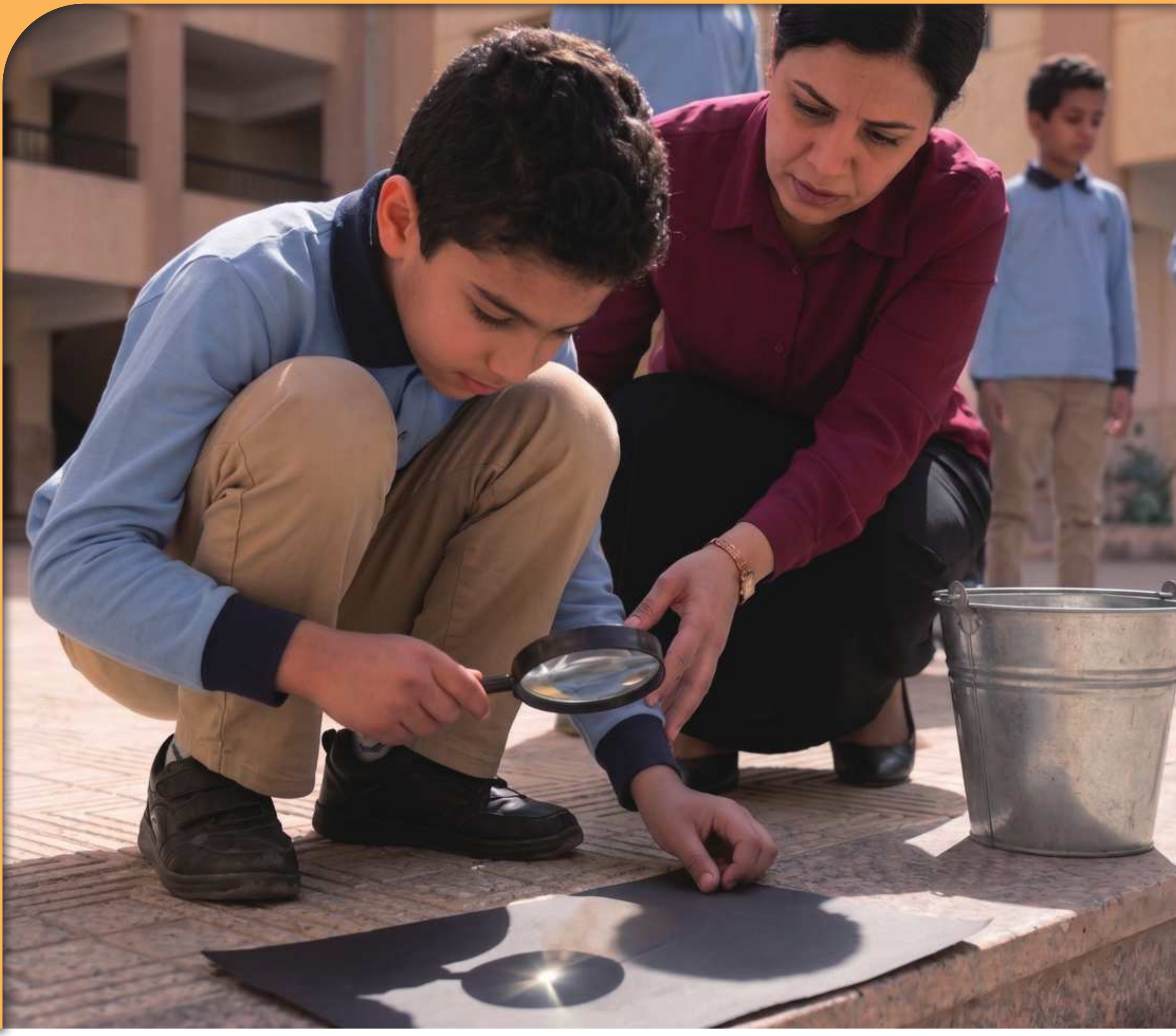


[Caution when using mirrors]

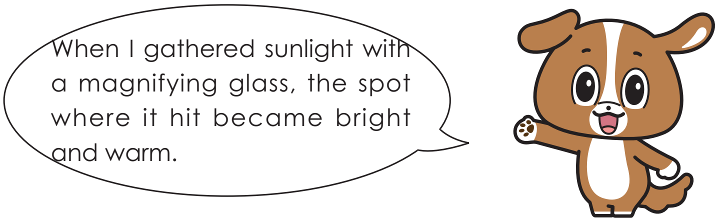
- If sunlight gets in your eyes, it will hurt them.
- Do not shine the reflected sunlight at people's faces or classroom windows.

4-2

Gathering Light



What happens to the brightness and warmth when we gather sunlight with a magnifying glass?


When I gathered sunlight with a magnifying glass, the spot where it hit became bright and warm.

Point! Changes When Gathering Light

Using a magnifying glass, you can gather sunlight from a wide area into a single point.

- Brightness: When you gather sunlight into one point, that part becomes **brighter**.
- Warmth: The smaller you make the point of light, the **higher** the temperature becomes.

The smaller you make the gathered sunlight with a magnifying glass, the **brighter** and **hotter** it becomes.

Things you must not do

- Do not look directly at the **Sun** with a magnifying glass. It will hurt your eyes.
- Do not gather sunlight on **people's bodies, clothes, or living things**. It may burn them or cause a fire.
- Do not look at the gathered point of light for a **long time**. It will hurt your eyes.

Warm Up Let's burn paper with sunlight!

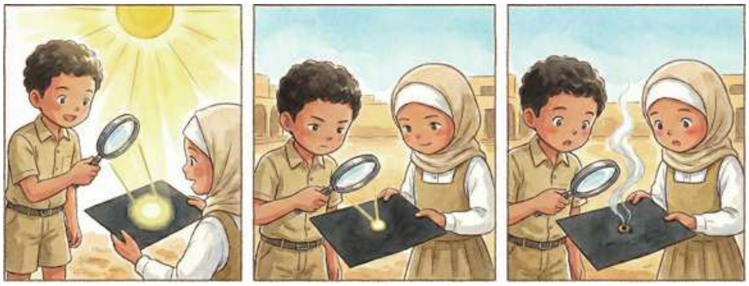
4

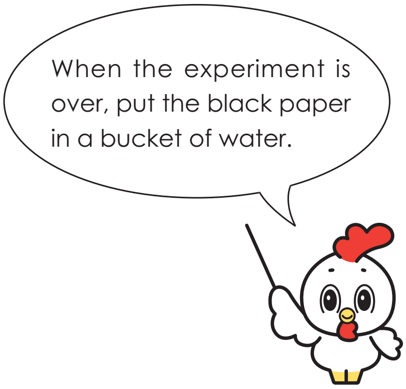
Let's use a magnifying glass to gather sunlight on black paper.

❶ **Make the light point small:**
Move the magnifying glass closer or further from the paper to make the point of light as small and clear as possible.

❷ **Wait still:**
Keep the light at its smallest point and wait without moving.

❸ **Observe:**
After a while, smoke will come out from the spot where the light hits, and the paper will burn.




When the experiment is over, put the black paper in a bucket of water.

Try

1 (1) Fill in the blank about what happens when sunlight hits a mirror and bounces back.

Sunlight reflected by a mirror travels (   ) forever.

(2) What do we call it when light hits an object and bounces back?

2 (1) Fill in the blanks with the correct words to describe gathering sunlight with a magnifying glass.

When you gather sunlight to one point, that part becomes
(①   ) and the temperature becomes (②   ).

(2) In the experiment to gather sunlight, which of the following is the correct way to burn paper quickly?

A: Move the magnifying glass over a wide area and hit a wide area with light.

B: Move the magnifying glass to make the point of light as small as possible.

C: Do not look at the point of light, but put the magnifying glass close to your eye and look at the sun.

(3) Fill in the blanks with the correct words to describe what you must not do when using a magnifying glass.

- Do not look directly at the (①   ) with a magnifying glass.
- Do not look at the place where sunlight is gathered for a (②   ).

Exercise

1 (1) Choose all correct answers explaining how sunlight travels from below.

A: When sunlight bounces off a mirror, it starts to travel in a curve.

B: Sunlight always has the property of traveling straight.

C: If you use two mirrors, you can send the reflected light to a different direction.

(2) Choose the correct words from below to fill in the blanks to make the explanation correct.

- Light reflected by a mirror travels (①).
- When light hits an object (like a mirror) and bounces back, it is called (②).

2 (1) Choose all correct answers about the experiment of gathering sunlight from below.

A: The smaller you gather the light, the higher the temperature becomes.

B: Black paper warms up faster than white paper because it absorbs sunlight better.

C: The gathered point of light is bright, but it is okay to keep looking at it directly.

(2) Choose the correct answer regarding safety in the sunlight experiment from below.

A: After the experiment, put the warmed paper in water.

B: Look directly at the sun with the magnifying glass.

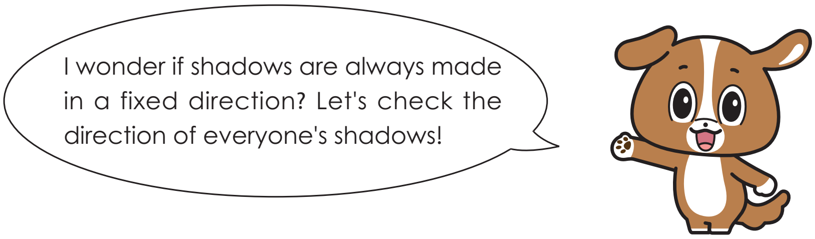
C: Put the warmed paper immediately into your pocket.

D: Shine the gathered light from the magnifying glass onto a friend's clothes.

4-3 Shadows and the Sun (1)

Chapter 4 ····· Properties of Light

What is the relationship between the direction of shadows and the position of the sun?


I wonder if shadows are always made in a fixed direction? Let's check the direction of everyone's shadows!

Point! Rules of Shadows

- Direction of Shadows:
  Shadows are made in the **opposite direction** of the sun.

When the sun is on the right, the shadow is always on the left. Let's look for the opposite side of the sun!

- Reason for Shadows:
  Sunlight travels **straight**. When it hits an object, it is blocked, creating a place behind it **where light does not reach**. This is a shadow.
- **"Sun-Object-Shadow"** always line up **in a straight line**.

Warm Up Let's check the shadow's direction!

Go outside and check the relationship between the sun's position and the shadow's direction.

❶ Check the sun's position:

Check which direction the sun is in.

[Caution]

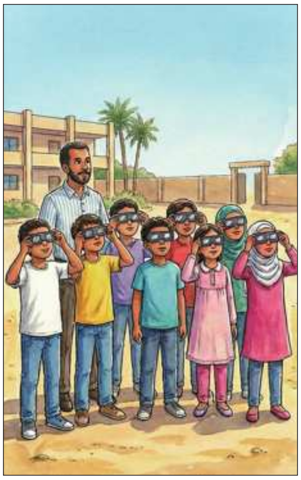
- Do not look directly at the sun. Use special sun-viewing glasses.

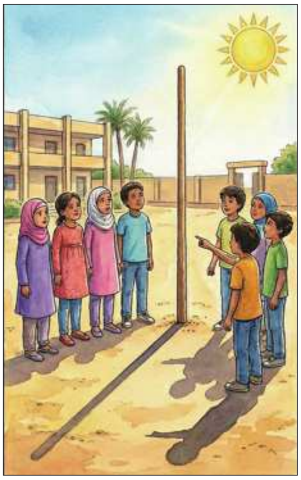
❷ Look at the shadow:

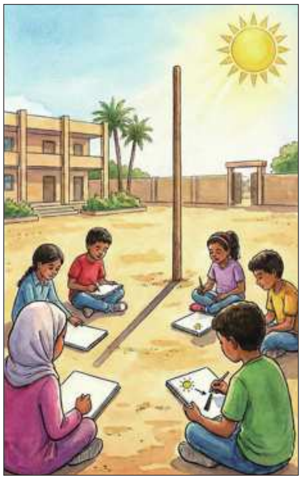
Observe which direction your shadow or a stick's shadow is stretching.

❸ Confirm the direction of Sun and Shadow:

Record that the direction of the sun and the shadow are opposite.



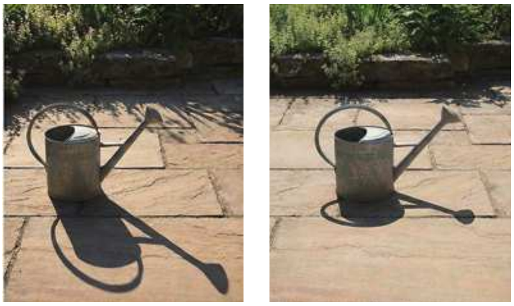


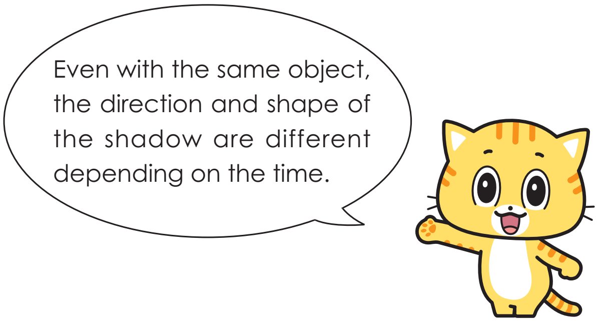


4-4 Shadows and the Sun (2)

Chapter 4 ····· Properties of Light

How do the direction and position of shadows change as time passes?



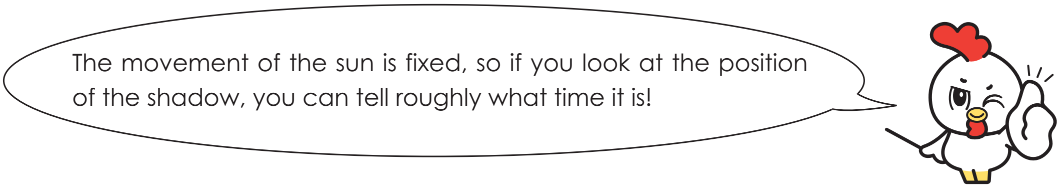

Even with the same object, the direction and shape of the shadow are different depending on the time.

Point! Movement of Shadows and the Sun

- The sun rises from the **East**, passes the **South**, and sets in the **West**. When the sun moves, the direction of the shadow (which is on the opposite side) also changes.

- **Sundial**:
  A tool to know the time by using the rule that shadows move in a fixed way.

- The length of the shadow also changes depending on the height of the sun.
  When the sun is high (around noon), the shadow becomes **short**. When the sun is low (morning or evening), the shadow becomes **long**.

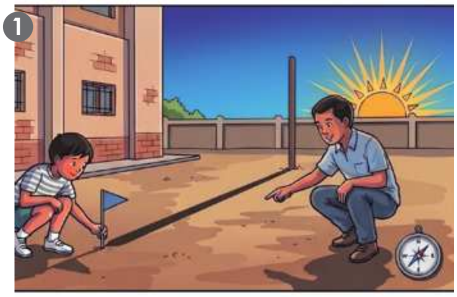

The movement of the sun is fixed, so if you look at the position of the shadow, you can tell roughly what time it is!

Warm Up Let's record the movement of shadows!

Let's check how the shadow of a stick moves in the same place throughout the day.

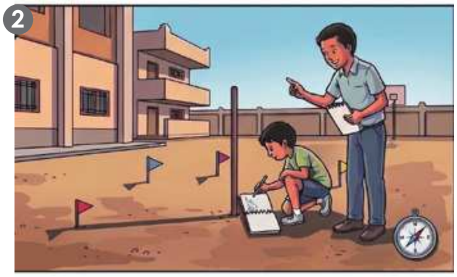
① Start recording:

In the morning, put a mark at the tip of the stick's shadow on the ground.



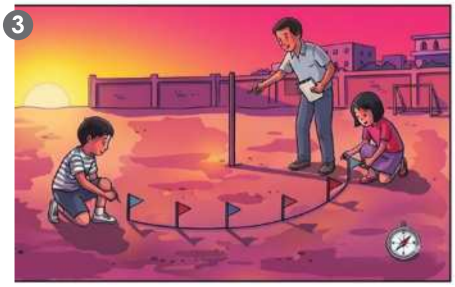
② Observe at different times:

Every hour, put a mark at the tip of the shadow and write down the time.



③ Connect with a line:

If you connect the marked points with a line, you can see how the shadow moved.



Try

1 (1) Fill in the blank about shadows.

Sunlight travels (   ), so when it hits an object, it is blocked, and a dark place is made behind it. This is a shadow.

(2) Choose the correct sentence about shadows from below.

A: When a shadow is made, the sun, the object, and the shadow are in a straight line.

B: Even if the sun is hidden by clouds, you can see the shadow clearly.

C: The shadow is made in the same direction as the sun.

2 (1) When the sun moves "East → South → West", how does the shadow move? Choose the correct words from below to fill in the blanks.

When the sun moves, the shadow is made on the (①   ) side of the sun, so the position of the shadow also (②   ).

① same / opposite   ② does not change / changes

(2) What is the name of the tool that tells time using the change in shadow position?

Exercise

1 (1) Fill in the blank about the direction of the sun and shadow.

The direction of the shadow is (   ) to the direction of the sun.

(2) Choose the correct reason why shadows are made from below.

A: Because sunlight travels straight and is blocked when it hits an object.

B: Because sunlight passes through objects like a mirror.

C: Because the sun is drawing the shadow on the ground.

2 (1) When is the shadow the shortest in a day? Choose the correct answer from below.

A: Morning when the sun rises.

B: Around noon when the sun is highest.

C: Evening when the sun sets.

(2) Choose all correct answers from below.

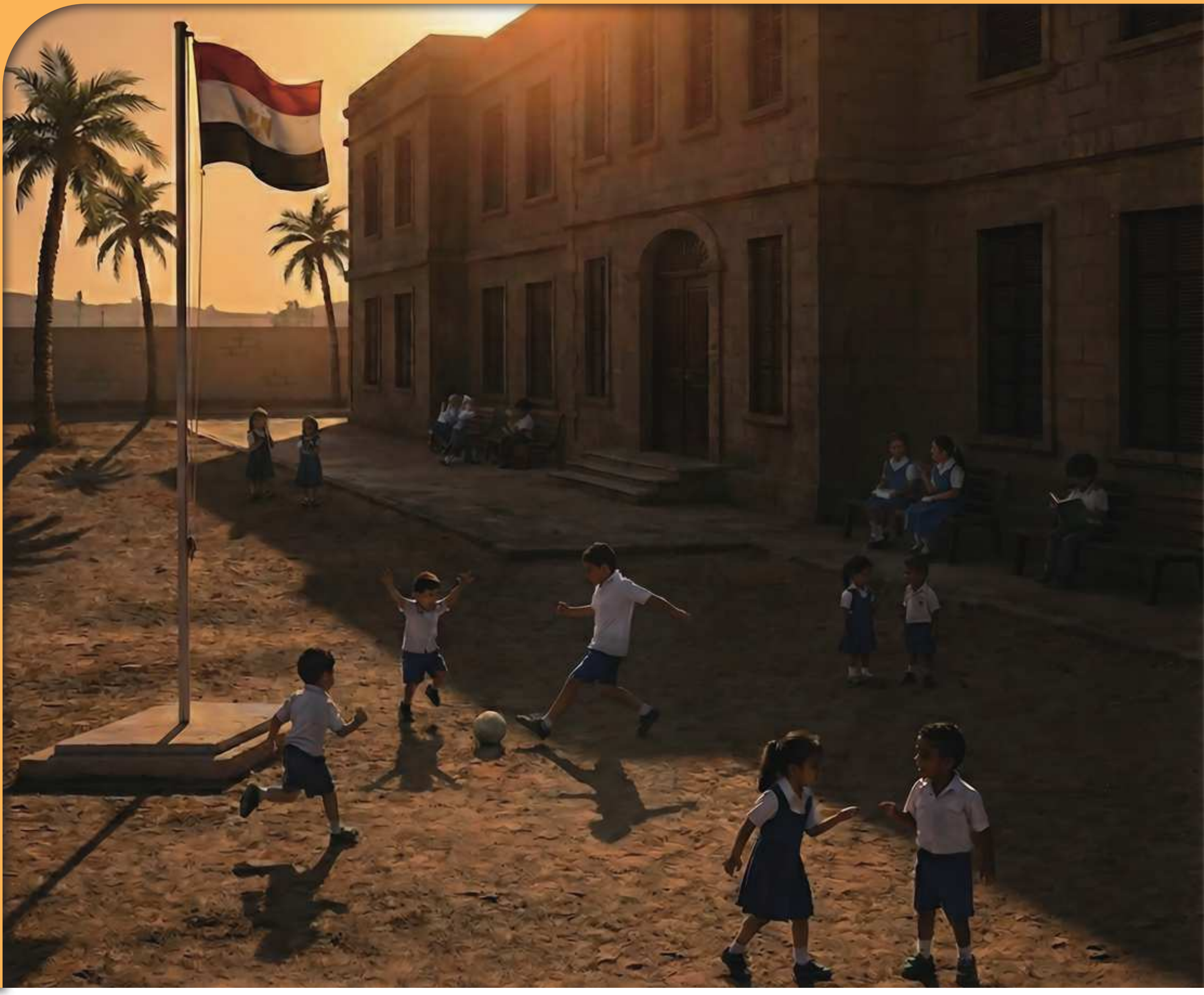
A: The direction of the shadow stays the same all day even if the sun moves.

B: When the sun moves from East to South, the shadow moves from West to North.

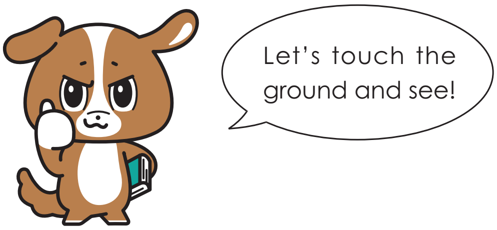
C: A sundial can tell time even when it is raining or at night when the sun is not out.

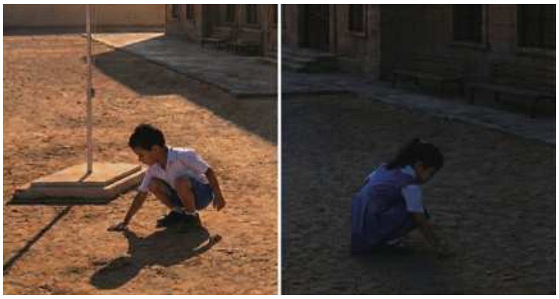
D: The lower the sun is, the longer the shadow becomes.

4-5 Sun and Shade



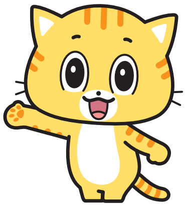
What is the difference in warmth and dampness of the ground between sunny and shady places?


Let's touch the ground and see!



Point! Differences between Sun and Shade

- The ground in sunny places becomes **warmer** than the ground in shady places. This is because **sunlight** warms the sunny ground.
- The temperature of the sunny ground **goes up** as time passes while absorbing sunlight.
- The ground in the shade is cooler and often **damp** compared to the sunny place.


The warmth of the ground depends on how much sunlight it gets!

Warm Up Let's measure the ground temperature!

Let's measure and compare the ground temperature in the sun and in the shade.

① **Choose the spots:**

Choose a place where sunlight hits well and a place that is in the shadow of a tree or wall.

② **Measure the temperature:**

Use a thermometer (or a radiation thermometer) to measure the temperature of each place.

[Caution]

- When using a thermometer, touch the bulb (bottom part) to the ground. Block direct sunlight from hitting the bulb using your hand or a shadow.
- When using a radiation thermometer, use it away from the ground.

→ Go to Page 101

③ **Check with your hands:**

Touch the ground directly and feel the difference in warmth and dampness.

Try

(1) Fill in the blanks with the correct words to describe the ground in the sun and shade.

The temperature of the sunny ground becomes (①) than the shady ground. The shady ground is cooler and often (②) compared to the sunny ground.

(2) Choose the correct reason why the sunny ground is warmer than the shade from below.

A: Because the shady ground absorbs a lot of sunlight.

B: Because the wind is not blowing at all in the sunny place.

C: Because direct sunlight hits the ground and warms it up.

Exercise

(1) Which of the following is NOT the correct way to measure ground temperature?

A: Make sure the bulb of the thermometer touches the ground firmly.

B: Make a shadow so that direct sunlight does not hit the bulb of the thermometer.

C: Hold the bulb of the thermometer tightly with your fingers to warm it with your body heat.

(2) Choose all correct characteristics of the ground in the shade from below.

A: The ground is often damp compared to the sunny place.

B: It receives direct sunlight and the temperature gets higher and higher.

C: The ground is cooler compared to the sunny place.

D: The ground is dry compared to the sunny place.

Let’s Expand!

Let's use a compass!

1 How to hold:

Hold the compass **flat** on your palm.

[Caution]

- If there are iron products, magnets, or electronics nearby, the needle may not move correctly.

2 Wait for the needle to stop:

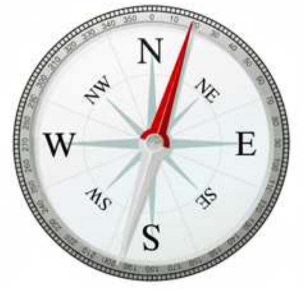
Wait still until the needle stops shaking.

3 Turn the dial:

- The red needle (or the marked needle) always points

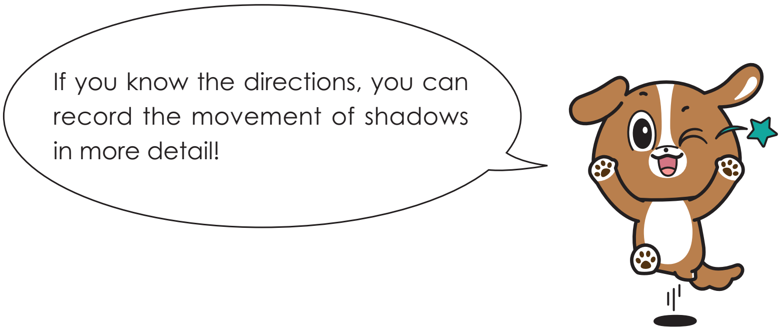
North (N).

- Slowly turn the dial of the compass to match the “North (N)” letter with the tip of the red needle.


N
NE
E
SE
S
SW
W
NW

4 Read the direction:

- Now you know which way is East, West, South, and North.
- Let’s see which direction the sun rises from and which direction the shadow stretches!


If you know the directions, you can record the movement of shadows in more detail!

Light and Sound

What is Happening at the Pyramids at Night

At the Giza Pyramids in Egypt, a “Sound and Light Show (Son et Lumière)” is held. This show tells a story about history, but it actually makes full use of the science rules of “light” and “sound” that you learn in school!

1 Light Traveling Straight Lights Up History

In the show, strong laser beams are pointed at the Sphinx and the pyramids from far away.

- **The Power to Travel Straight:**

  They use the rule that light travels in a perfectly straight line through the air to hit the exact spot they want.

- **Colors and Bouncing (Reflection):**

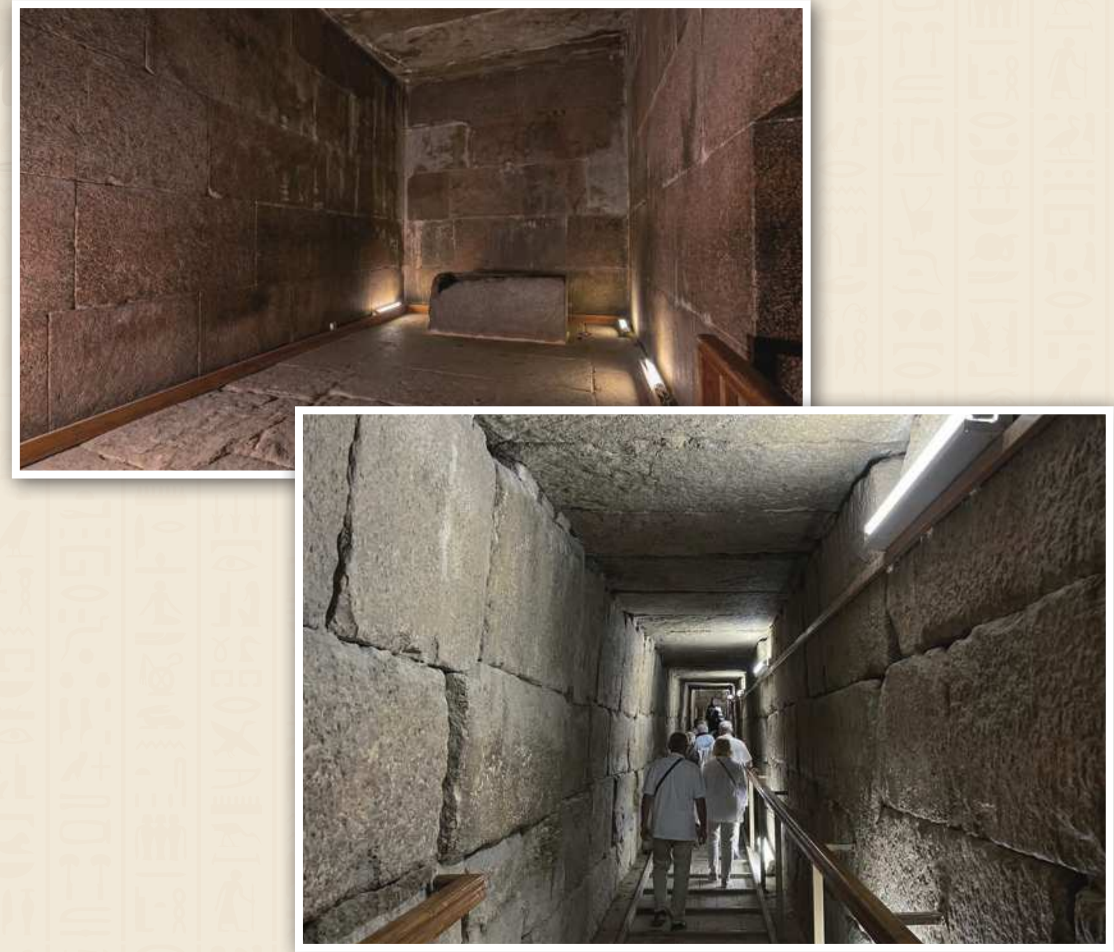
  When the light bounces off the stones of the pyramids, beautiful colors reach our eyes.

2 The “Memory of Stones” Told by Sound

The inside of the pyramids and the temple walls are made of giant stones.

- **Sound Bouncing (Reflection):**

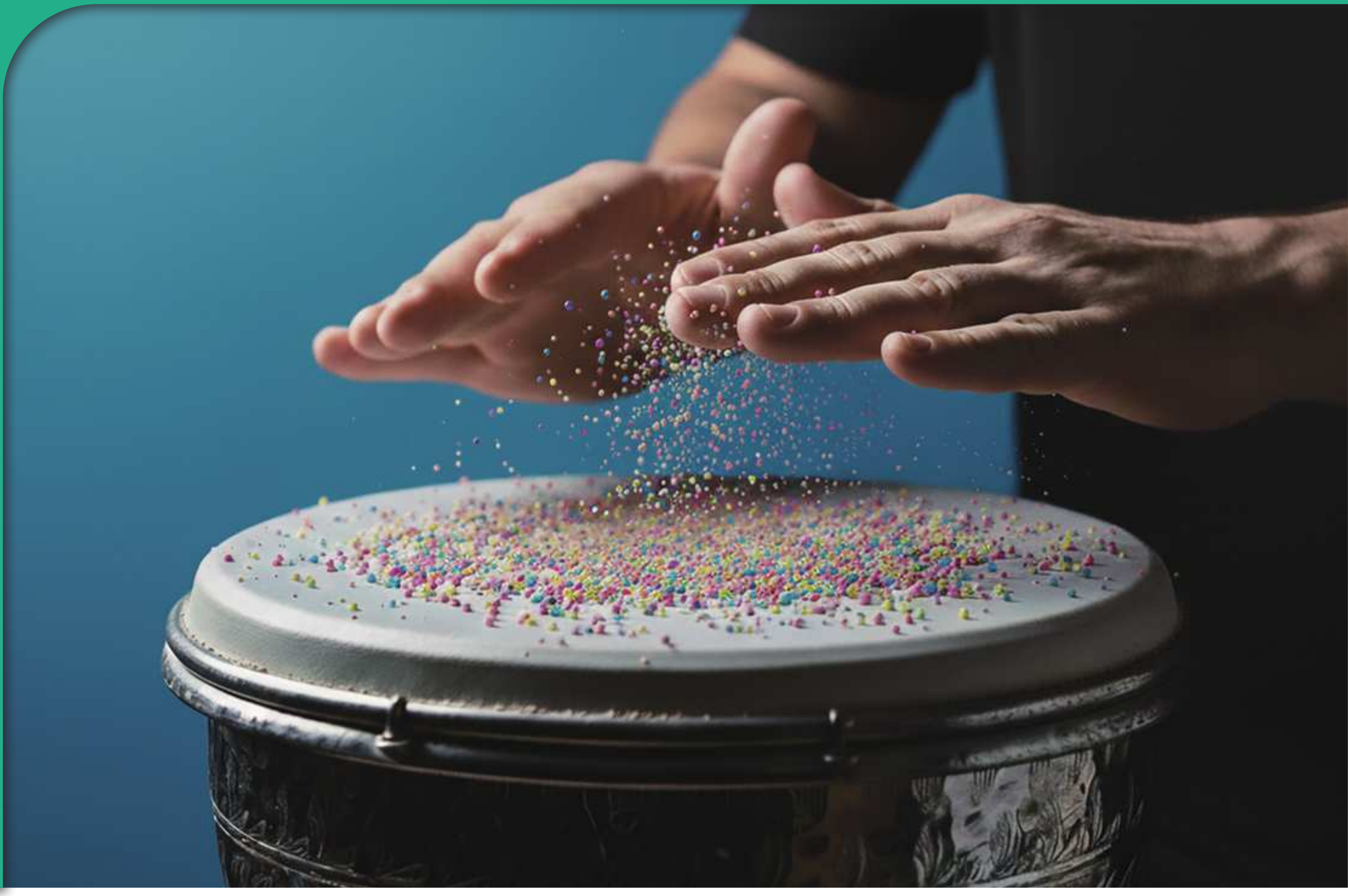
  Stones are really good at bouncing sound. How did the voices of ancient kings echo inside the huge temples? The speakers for the show are placed in special spots by calculating how sound bounces off the stones.



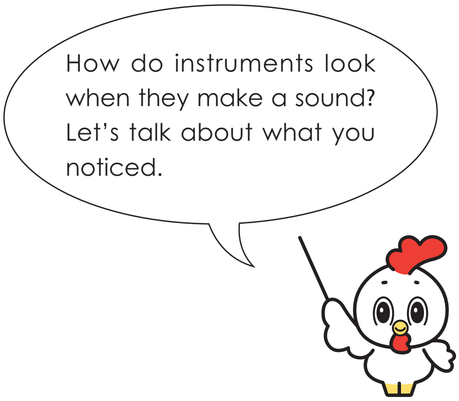
5-1

How Sound is Produced

Chapter 5 ····· Properties of Sound

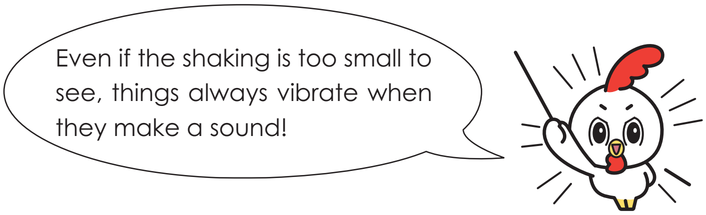


What happens to things when they make a sound?


How do instruments look when they make a sound? Let's talk about what you noticed.

Point! Sound and Vibration

- When a thing makes a sound, it is shaking. This shaking is called **vibration**.
- When the vibration stops, the sound **stops**.
- When a thing shakes, the air around it also shakes. When this shaking reaches our ears, we hear the sound.


Even if the shaking is too small to see, things always vibrate when they make a sound!

Warm Up Let's check sound and shaking!

8

Let's use things around us to check the connection between sound and vibration.

① **Put your hand on your throat:**

Feel how your throat shakes with your fingertips while you are talking.

Check what happens to the shaking when you stop talking.

② **Hit a triangle:**

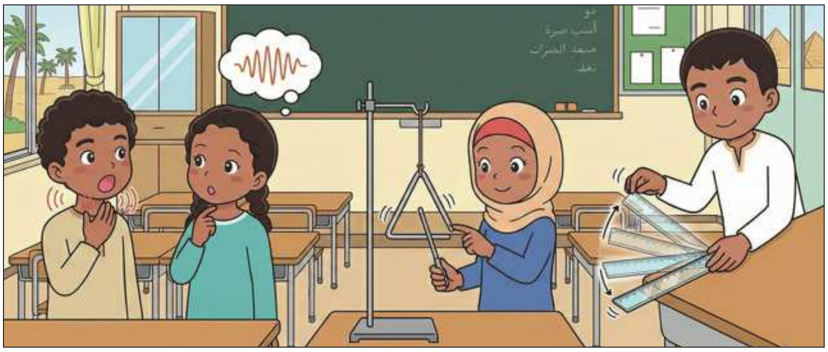
Hit a triangle to make a sound, and then touch it with your fingers.

Check how the sound and shaking change.

③ **Flick a ruler:**

Put a ruler on the edge of a desk, and flick the part that sticks out.

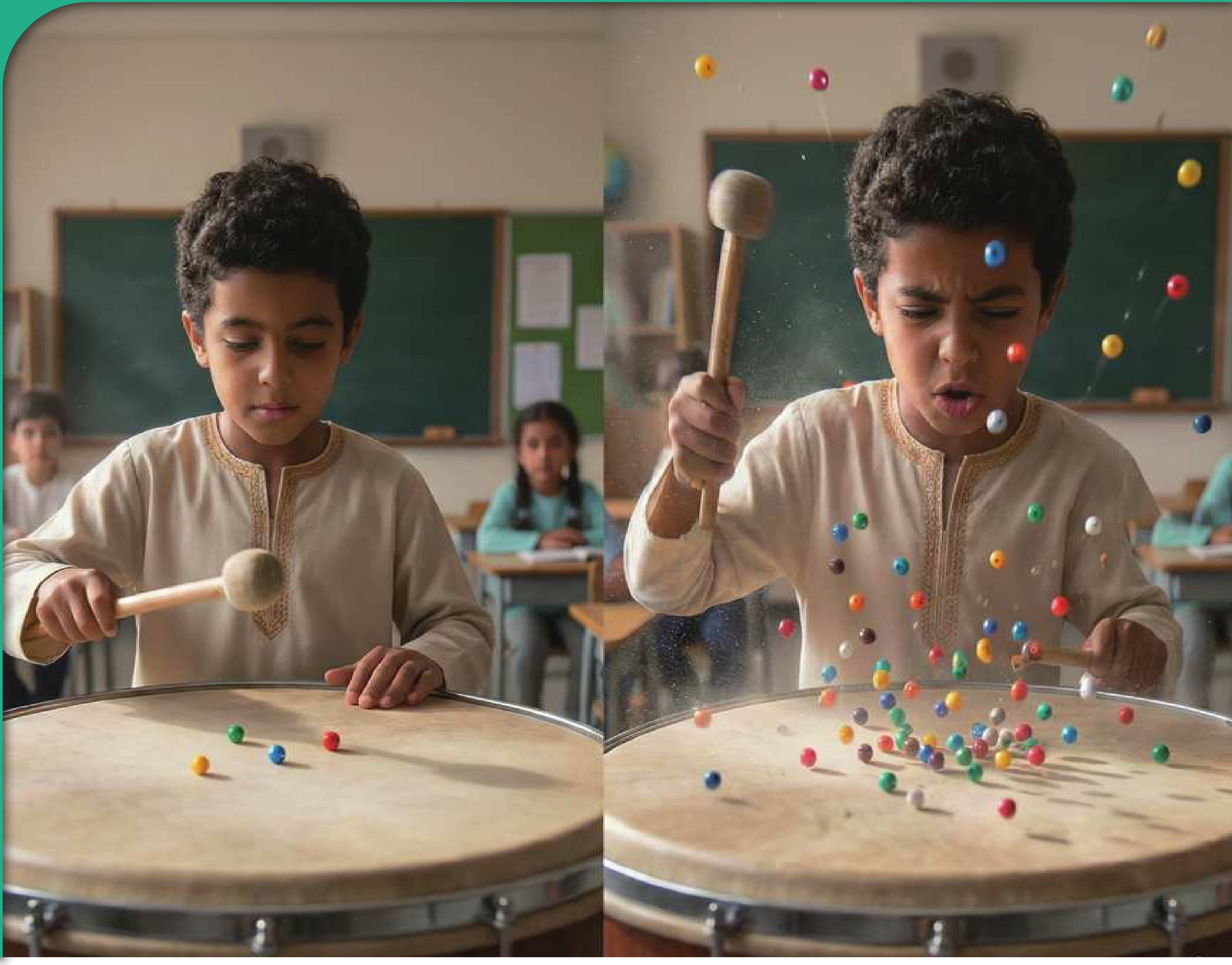
Watch how the ruler moves while it makes a sound.



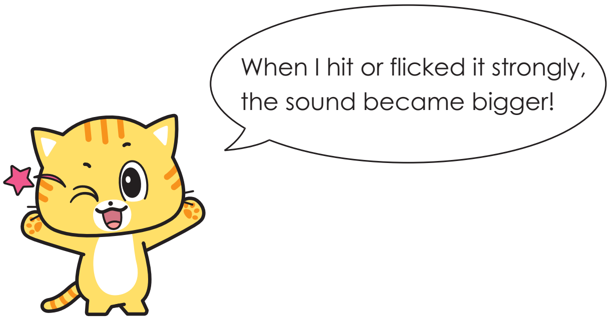
5-2

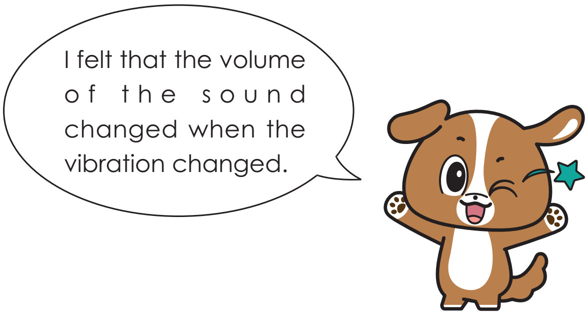
Volume of Sound and Vibration

Chapter 5 ····· Properties of Sound



What is the difference in how things vibrate when they make big sounds and small sounds?


When I hit or flicked it strongly, the sound became bigger!

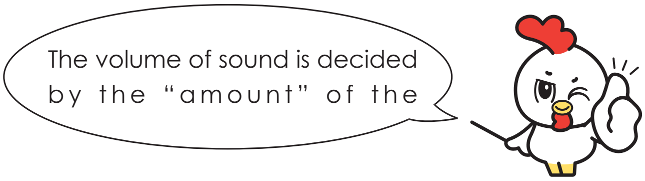

I felt that the volume of the sound changed when the vibration changed.

Point! Volume of Sound and the Amount of Vibration

When the amount of vibration changes, the volume of the sound changes.

- Big sound: Things vibrate **a lot**.
- Small sound: Things vibrate **a little**.

The bigger the "amount" of the vibration is, the **bigger** the sound becomes.

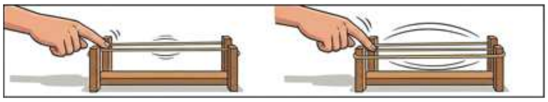

The volume of sound is decided by the "amount" of the

Warm Up Let's compare the amount of vibration!

Let's do an experiment to see how the volume of sound changes when the amount of vibration changes.

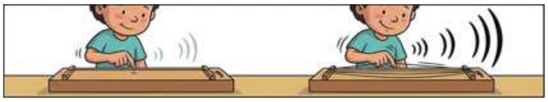
① **Flick a rubber band:**

Compare how the rubber band moves (the amount of vibration) when you flick it weakly and strongly.



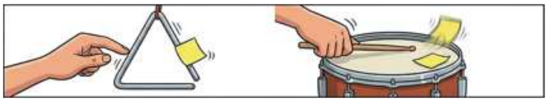
② **Watch a monochord (string):**

Flick the string of an instrument, and see how the amount of vibration of the string changes between big sounds and small sounds.



③ **Make the sound bigger:**

Prepare a triangle or a drum with a sticky note on it. See how the sticky note looks different when you hit it weakly and strongly.



[Caution]

- Do not make loud sounds near your ears, because it can hurt them.

Try

1 (1) Fill in the blank about how things look when they make a sound.

When a thing makes a sound, it vibrates finely.

(2) After hitting a triangle, you pressed it hard with your fingers to stop the vibration. What happens to the sound? Choose the correct answer from below.

A: Even if you stop the vibration, the sound continues for a while.

B: When you stop the vibration, the sound also stops right away.

C: When you stop the vibration, the sound becomes even bigger.

2 (1) Fill in the blanks with the correct words to show the connection between sound volume and vibration.

When a big sound is made, the vibration of a thing becomes (①).

When a small sound is made, the vibration of a thing becomes (②).

(2) You flicked a rubber band strongly and made a big sound. How is the "size" of the vibration of the rubber band? Choose the correct answer from below.

A: The size is wider than when flicked weakly.

B: The size is narrower than when flicked weakly.

C: The size does not change at all.

Exercise

1 (1) Which of the following are shaking when they are making a sound? Choose all correct answers from below.

A: Guitar strings when making a sound

B: The drum skin after you hit it and pressed it with your hand

C: Your "throat" when you are talking

D: A whistle on the desk that is not making a sound

(2) Choose all correct answers about the connection between sound and vibration from below.

A: Things can make a sound even if they do not vibrate.

B: When things stop vibrating, you cannot hear the sound.

C: When things vibrate, the air around them also shakes, and we hear the sound when the vibration reaches our ears.

2 (1) You hit a drum and changed the sound from loud to soft slowly. Choose the correct answer about this difference from below.

A: The size of the drum skin's vibration does not change, and only the sound becomes softer.

B: The vibration of the drum skin gradually becomes smaller.

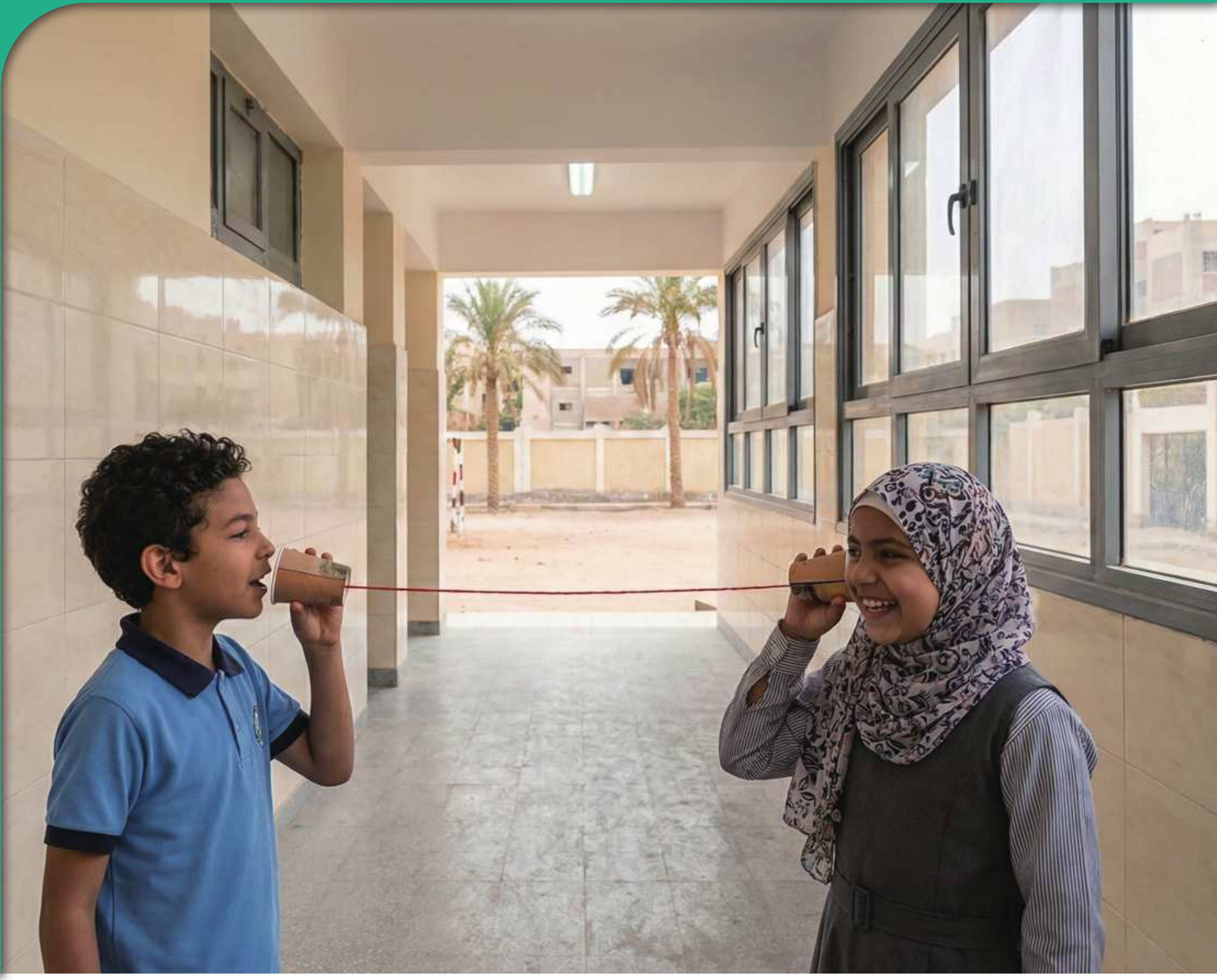
C: You can hear the sound even if the drum skin stops vibrating.

(2) Fill in the blanks with the correct words to complete the sentences.

When you change the volume of the sound, the size of the thing's (①) changes. To make a big sound, you should make the thing vibrate (②).

5-3 How Sound Travels

Chapter 5 ····· Properties of Sound



Does sound travel through things like string?

When the string was pulled tight, I could hear the voice clearly!

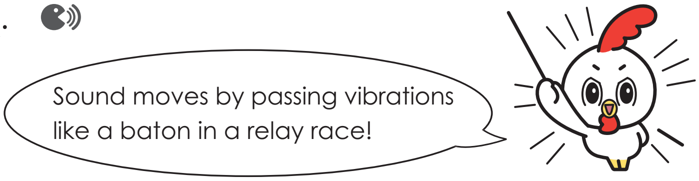
What happens if we pinch the string with our fingers?

Point! Things That Carry Sound

❗ The vibration of sound travels not only through the air but also through **"things"** like string.

❗ Sound travels when things vibrate. In a string telephone, the vibration of your voice travels from **"paper cup → string → paper cup"** and reaches the ears.

- When the string is pulled tight, the vibration travels well, so **the sound travels easily**.
- If you pinch the string in the middle, the vibration stops there, so **the sound does not travel**.


Sound moves by passing vibrations like a baton in a relay race!

Warm Up Let's experiment with a string telephone!

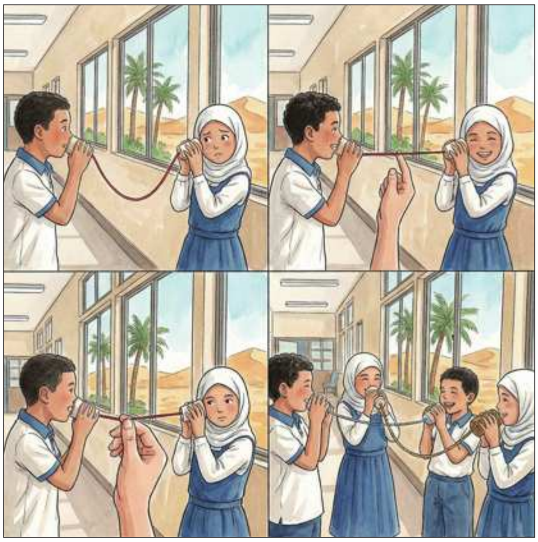
9

Let's make a string telephone and check when you can hear the sound.

*How to make a string telephone is on page 75.

❶ **Pull the string:**

Check the difference in how you hear when the string is loose and when it is pulled tight.



❷ **Touch the string:**

Touch the string lightly while your friend is talking, and check that the string is shaking.

❸ **Pinch the string:**

Pinch the string tightly with your fingers and check what happens to your friend's voice.

❹ **Change the string to something else:**

Let's try what happens if you use a wire or yarn instead of a string. Notice what happens to the sound.

Try

(1) Choose the correct words from below to fill in the blanks.

When you talk into the paper cup, the bottom of the cup first (①), and the vibration travels through the (②) to your friend.

vibrates / string / sun

(2) Which is important to hear your friend's voice on a string telephone? Choose the correct answer from below.

A: Leave the string loose.

B: Pull the string tight to let the vibration travel.

C: Have someone pinch the string with their fingers in the middle.

Exercise

(1) Which of the following did you learn from the string telephone experiment? Choose all correct answers from below.

A: When the string vibrates finely, you hear the voice.

B: A string telephone sounds just as loud through the air even without a string.

C: When you press the string with your fingers to stop the shaking, you cannot hear the sound.

(2) Mark ✓ for correct answer about a string telephone, and ✗ for the incorrect one.

① ( ) A loud voice travels even when the string of the string telephone is not vibrating.

② ( ) Even if you use a wire instead of a string, you can hear the sound if the vibration travels.

③ ( ) The vibration of sound travels not only through the air but also through things like string.

Let's Make It

Let's Make a String Telephone

Materials

- 2 paper cups
- Kite string
- Paper clips or toothpicks

Tools to use

- Scissors
- Cellophane tape
- Pens
- An awl (a tool to make holes)

How to make

❶ **Prepare 2 paper cups:**

You can draw your favorite pictures, patterns, or color them.

❷ **Make a hole in the paper cups:**

Make a small hole in the center of the bottom of the paper cups from step 1 with an awl, big enough for the kite string to pass through.

❸ **Pass the string through:**

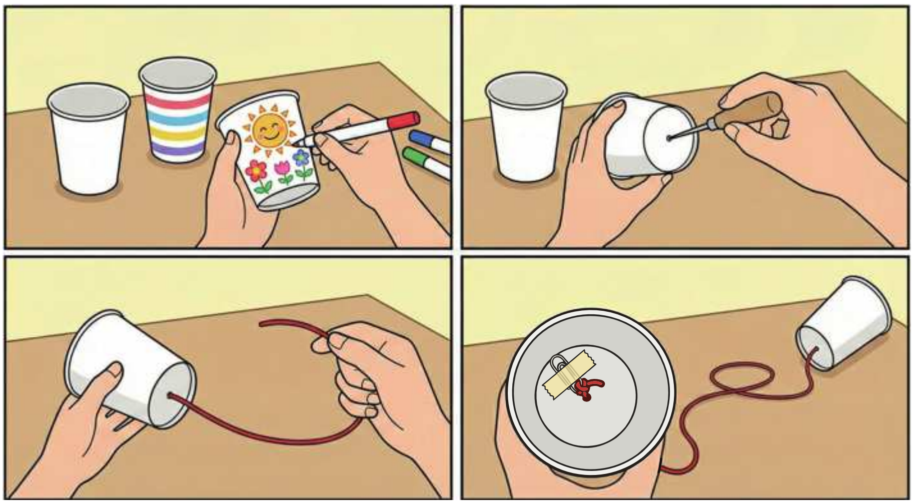
Pass the kite string through the bottom of one paper cup (from the outside to the inside).

❹ **Fix the string:**

- Tie a paper clip or a toothpick broken in half tightly to the end of the string.
- Tape it from the inside of the paper cup so the knot does not come out.
- Do the same for the other cup.

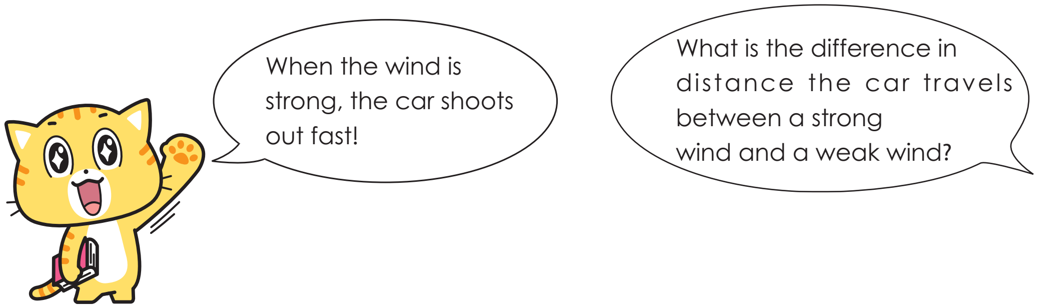
❺ **Finished:**

Pull the string tight, talk into one cup, and put the other cup to your ear.



6-1 Wind-Powered Cars

How does the distance a car travels change when you change the strength of the wind?


When the wind is strong, the car shoots out fast!
What is the difference in distance the car travels between a strong wind and a weak wind?

Point! Wind strength and how things move

A force is a push or pull that can cause a stationary object to move, stop a moving object, or change the direction of its motion. The greater the force, the greater its effect on the object.

Wind has the power to move things, and how things move changes depending on how strong the wind is.

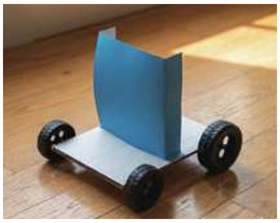
- **Weak wind:**
  Since the power to move things is **small**, the distance the car travels is **short**.
- **Strong wind:**
  Since the power to move things is **big**, the pushing force on the car becomes stronger, and the distance it travels is **long**.

Warm Up Let's make a wind-powered car and move it!

1

Make a car with a sail, change the strength of the wind, and let's check the differences in how it moves.

How to make a wind-powered car



① **Make the body:**
Use cardboard or a food tray to make the body of the car.

② **Make the wheels:**
Put an axle through the body and attach tires. (You can also make tires by making a hole in the center of a plastic bottle cap.)

③ **Put up a sail:**
Make a sail out of thick paper and attach it to the body with tape.

① **Blow a weak wind:**
Set the fan to "Weak" and measure the distance from the start line to where the car stops using a tape measure.

② **Blow a strong wind:**
Set the fan to "Strong", start from the same place, and measure the distance.

③ **Observe the movement:**
Record what differences there are in "how it starts moving" and "speed".

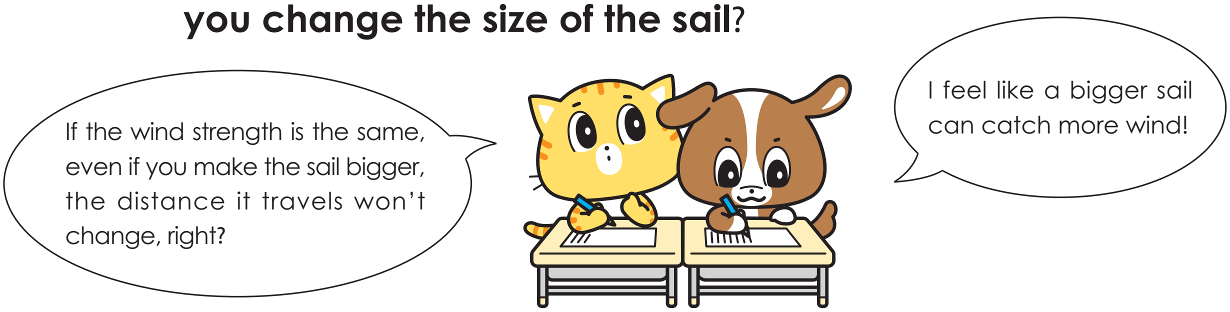
Wind Strength	Distance Traveled		
	Trial 1	Trial 2	Trial 3
Weak Wind			
Strong Wind			

6-2

Sail Size

Chapter 6 ····· The Force of Wind

How does the distance the car travels change when you change the size of the sail?


If the wind strength is the same, even if you make the sail bigger, the distance it travels won't change, right?
I feel like a bigger sail can catch more wind!

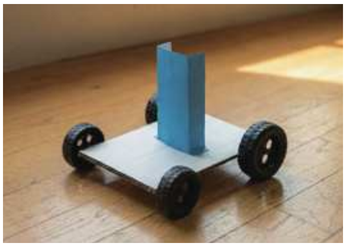
Point! Wind power and how things move

When the wind strength is the same, the bigger the place that catches the wind (the sail), the **bigger** the power it gets from the wind.

- **Small sail:**
  Since the area catching the wind is **small**, the power it gets from the wind is small, and the distance the car travels is **short**.
- **Large sail:**
  Since the area catching the wind is **big**, the power it gets from the wind is big, and the distance the car travels is **long**.

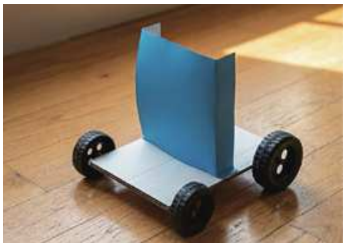
Warm Up Let's experiment by changing the sail size!

Using the same car and fan, let's experiment to see how the distance it travels changes just by the size of the sail.



❶ Try with a small sail:

Attach a small sail and blow wind from the fan. Put a piece of tape as a mark where the car stops.



❷ Try with a large sail:

Change to a large sail. **Keep the wind strength the same** and start from the same place.

❸ Compare the distances:

Which sail made the car go farther? Let's discuss the relationship between the "area" that catches the wind and the "power".

Sail Size	Distance Traveled		
	Trial 1	Trial 2	Trial 3
Small			
Large			

Try

1 (1) Fill in the blank about the experiment with wind-powered cars.

The distance the car travels is (   ) when it is hit by a strong wind than when it is hit by a weak wind.

(2) Mark ✓ for correct answer about wind-powered cars, and ✕ for the incorrect one.

① (   ) Wind has the power to move things.

② (   ) For a wind-powered car, the distance it travels does not change even if you change the strength of the wind.

③ (   ) When a weak wind hits a wind-powered car, the distance it travels is shorter than when a strong wind hits it.

2 (1) Fill in the blanks with the correct words to explain the experiment with wind-powered cars.

If you make the sail bigger, the power to catch the wind becomes (①   ), and the distance the car travels becomes (②   ).

(2) Choose the correct idea to catch more wind power from below.

A: Make the “sail” that catches the wind smaller.

B: Make the “sail” that catches the wind bigger.

C: Take the “sail” off the car.

Exercise

1 (1) Choose all correct answers about the power of wind from below.

A: When the wind power becomes stronger, its power to move things also becomes bigger.

B: We cannot see the wind, but it can make power when it hits things.

C: No matter how strong the wind is, the distance the car travels is always the same.

(2) Fill in the blanks with the correct words to explain the experiment with wind-powered cars.

Since a strong wind has a (①) power to move things, the force to push the car becomes stronger, and the distance it travels becomes (②).

2 (1) When the wind strength is the same, which car can travel the "farthest"? Choose the correct answer from below.

A: A car with no sail

B: A car with a small sail

C: A car with a large sail

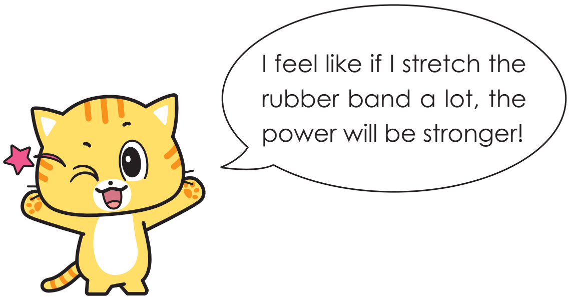
(2) Fill in the blanks with the correct words to explain the experiment with wind-powered cars.

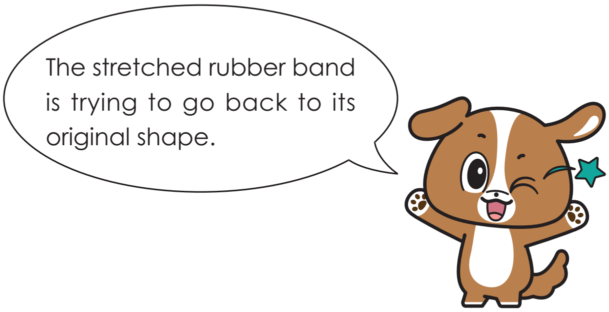
Small sail: Since the area catching the wind is small, the power it gets from the wind becomes (①), and the distance the car travels becomes (②).

7-1 Rubber Band-Powered Cars

Chapter 7 ····· The Force of Rubber

How does the distance the car travels change when you change how long you stretch the rubber band?


I feel like if I stretch the rubber band a lot, the power will be stronger!


The stretched rubber band is trying to go back to its original shape.

Point! The power of rubber bands and how things move

A rubber band has a nature to **try to return to its original shape** when it is stretched. You can use the power of a stretched rubber band to make things fly or make cars run.

The longer you stretch the rubber band, the stronger the power to return to its original shape, and the **bigger** the power to move things.

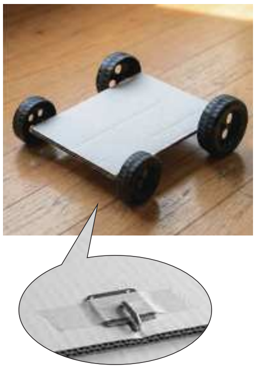
Warm Up Let's make a rubber band-powered car and move it!

2

Using a car powered by a rubber band, let's find out the relationship between how much the rubber band is stretched and the distance it travels.

How to make a rubber band-powered car

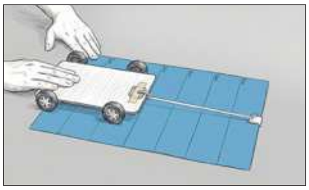
1. Take off the sail from the wind-powered car used in 6-1.
2. Attach a hook to the bottom of the car. Tape it tightly so it doesn't come off. (Picture: Bottom of the car)
3. Make a launching pad with a plastic board or something similar. Hook the rubber band to the hook, and set the point where the rubber band starts to stretch as 0 cm.



What the back side looks like

① Stretch it a little:

Stretch the rubber band by just 5 cm, let go, and measure the distance it traveled.



② Stretch it long:

Stretch the rubber band longer to 10 cm and 15 cm, and see how the distance it travels changes.

③ Record:

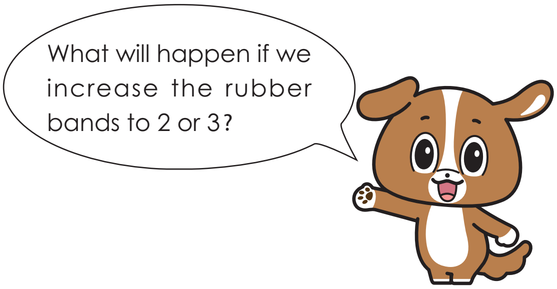
Record the distance it traveled.

Stretched length of the rubber band	Distance Traveled		
	Trial 1	Trial 2	Trial 3
5 cm			
10 cm			
15 cm			

7-2 Power of Rubber Bands

How can I make the power of the rubber band stronger?

Is there any other way besides stretching the rubber band longer?


What will happen if we increase the rubber bands to 2 or 3?

Point! Combining the power of rubber bands

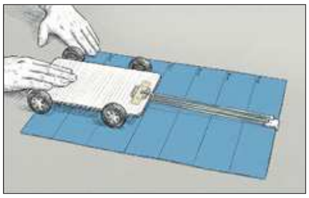
- **The longer you stretch the rubber band**, the stronger the power to move things becomes.
- When you **increase the number of rubber bands**, the power of each rubber band trying to return to its original shape is combined, and the power to move the car becomes even **stronger**.

Warm Up Let's increase the number of rubber bands and run the car!

Instead of changing the length of the rubber band, let's increase the "number" and see how the distance the car travels changes.

① **Run with 1 rubber band:**

Stretch the rubber band by 10 cm, let it run, and measure the distance.



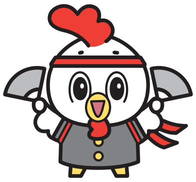
② **Run with 2 rubber bands:**

Increase the rubber bands to 2, bundle them, **stretch them by the same 10 cm**, and let it run.

③ **Record:**

When there are 2 rubber bands, what is the difference in the distance the car travels? Let's record and discuss.

Number of rubber bands	Distance Traveled		
	Trial 1	Trial 2	Trial 3
1			
2			



When you increase the number of rubber bands, the power to move the car goes up!

Try

1 (1) Fill in the blanks with the correct words to explain the experiment with rubber band-powered cars.

The longer you stretch the rubber band, the (①) the power to move the car becomes, and the distance the car travels becomes (②).

(2) When does a rubber band produce power? Choose the correct answer from below.

A: When the rubber band is loose and relaxed.

B: When the rubber band is stretched and trying to return to its original shape.

2 (1) We increased the number of rubber bands to make the power to move the car stronger. When we do this, what happens to the distance the car travels?

(2) We want to make the power of the rubber bands stronger to move a car carrying a heavy load. What should I do? Choose all correct answers from below.

A: Decrease the number of rubber bands.

B: Increase the number of rubber bands.

C: Stretch the rubber bands longer.

D: Stretch the rubber bands shorter.

Exercise

1 (1) Choose all correct answers about the power of rubber bands from below.

A: No matter how long you stretch the rubber band, the distance the car travels is always the same.

B: The longer you stretch the rubber band, the faster the car starts running.

C: When the rubber band returns to its original shape, the power to move the car is gone.

(2) Choose the correct words from below to fill in the blank.

From the results of the experiment, we learned that making the power of the wind or rubber bands (   ) allows us to move the car farther.

stronger / weaker

2 (1) Choose all correct answers on how to make a rubber band-powered car run “farther” from below.

A: Stretch the rubber band longer than usual.

B: Stretch the rubber band shorter than usual.

C: Increase the number of rubber bands.

(2) When stretched to the same length of 15 cm, which of the following has the “weakest” power to move the car? Choose the correct answer from below.

A: When using 1 rubber band

B: When using 2 rubber bands

C: When using 3 rubber bands

Force and Motion

Egypt's Wisdom and Future Energy

In Egypt, people have developed clever ways to use the "power of the wind" since ancient times, and now they use "stored power" too.

1 "Felucca" that Catches the Wind's Power

The traditional sailboat running on the Nile River, called a Felucca, uses 100% of the wind's power.

- **Catching the wind:**

  By changing the direction of the sail, they adjust which way the wind pushes, so the boat goes exactly where they want to go.

- **Changing energy:**

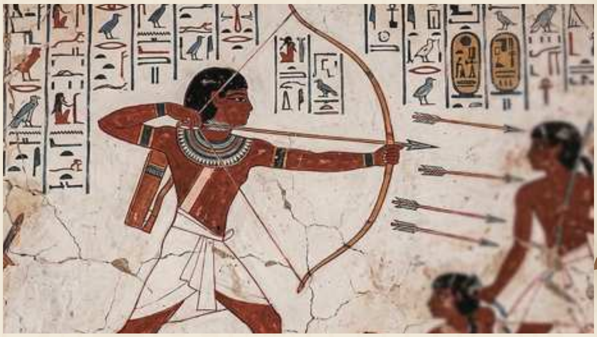
  They change the "moving power of air" (wind) into the "moving power" to make the boat go.

2 Let's Use the "Power to Snap Back"

The "power of rubber" you learned about in science experiments uses the power of a stretched rubber band trying to snap back to its original shape.

- **Storing energy:**

  The harder you pull the rubber band, the more "power" you can store inside it.



- **Ancient wisdom:**

  The ancient Egyptian weapon, the "bow and arrow," was also a tool that boosted this "power to snap back" as much as possible.

3 One of the World's Biggest Wind Power Plants

Along the coast of the Red Sea in Egypt, there are many giant wind turbines lined up, making this wind farm one of the largest in the world.

- **Zafarana Wind Power Plant:**

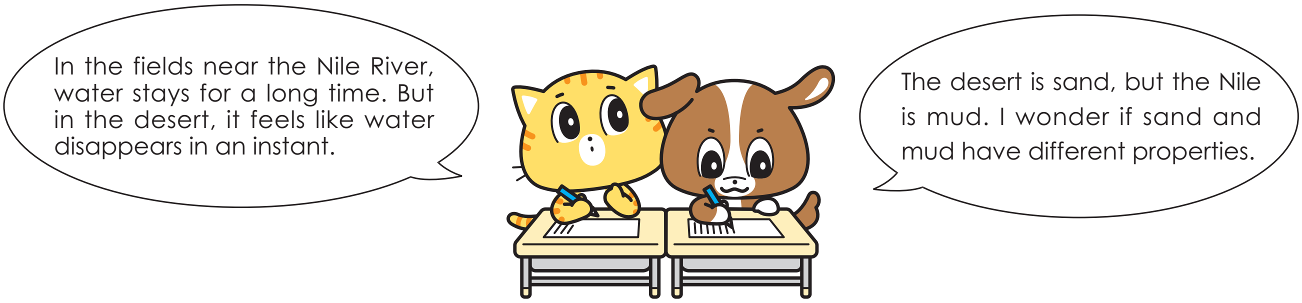
  Here, the same "wind" that used to move boats on the Nile is now being turned into "electricity"!

8-1

The Relationship Between the Ground and Water

Chapter 8 ····· Soil, Water, and Life in Egypt

Desert sand and Nile River mud, which lets water pass through faster?


In the fields near the Nile River, water stays for a long time. But in the desert, it feels like water disappears in an instant.
The desert is sand, but the Nile is mud. I wonder if sand and mud have different properties.

Point! Particle Size and Egypt's Soil

The speed at which water soaks into the ground depends on **the size of the particles** that make up the soil.

Soil with large particles (like gravel and desert sand):

- Because the spaces between the particles are large, **the paths for water are wide**.
- Water soaks in **fast**. So, even if it rains, the ground dries up quickly.

Soil with small particles (like Nile River mud and clay):

- Because the particles are very fine, they stick close together, and **the spaces become small**.
- Water is hard to pass through, and it soaks in **slowly**.

▼**Desert Sand**

▼**Nile River Mud**

Ideas used in Egypt:

- The Nile River mud can hold water and nutrients for a long time, so it is good for farming.
- On the other hand, when farming in the desert where water soaks in too fast, special ideas are needed to keep the water from escaping.

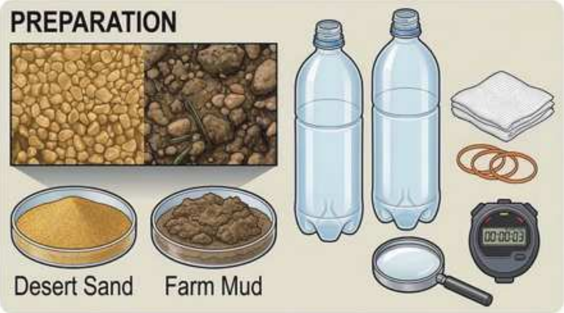
10

Warm Up Let's do an experiment with Egypt's soil!

Let's compare how water moves using desert sand and farm mud (or fine soil).

❶ Preparation:

- Desert sand
- 2 plastic bottles
- Rubber bands
- Magnifying glass
- A scalpel (cutting knife) should be used by the teacher only
- Farm mud
- Gauze
- Stopwatch

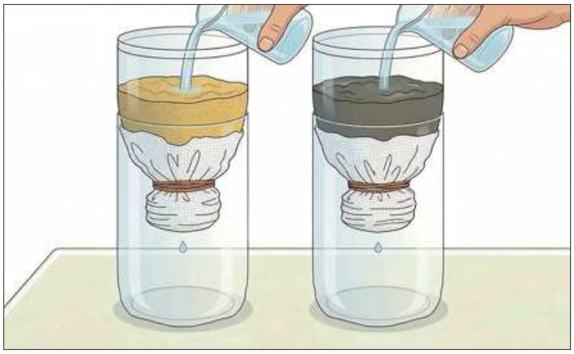


❷ Observe:

- Touch the desert sand and farm mud with your hands and look at them with a magnifying glass to compare them.

❸ Experiment:

- Cut 2 plastic bottles, put cloth on the mouths, and turn them upside down.
- Put the same amount of desert "sand" in one bottle and farm "fine soil (mud)" in the other.
- Pour the same amount of water at the same time, and use a stopwatch to measure which one starts dropping water into the cup below first.



❹ Look at the results:

Observe not only the speed at which water passes through, but also if there is a difference in how long water stays on the surface of the soil.

Try

(1) How does the speed of water soaking in change when the soil particles are larger?

(2) What are the properties of the fine “mud (silt)” along the Nile River in Egypt? Choose the correct answer from below.

A: The particles are large, and water passes through quickly.

B: The particles are small, and water passes through quickly.

C: The particles are small, and water soaks in slowly.

Exercise

(1) When it rains a lot in the desert, why does the ground dry up quickly? Explain using the words “particles” and “spaces”.

(2) Choose all correct answers about how water soaks into soil from below.

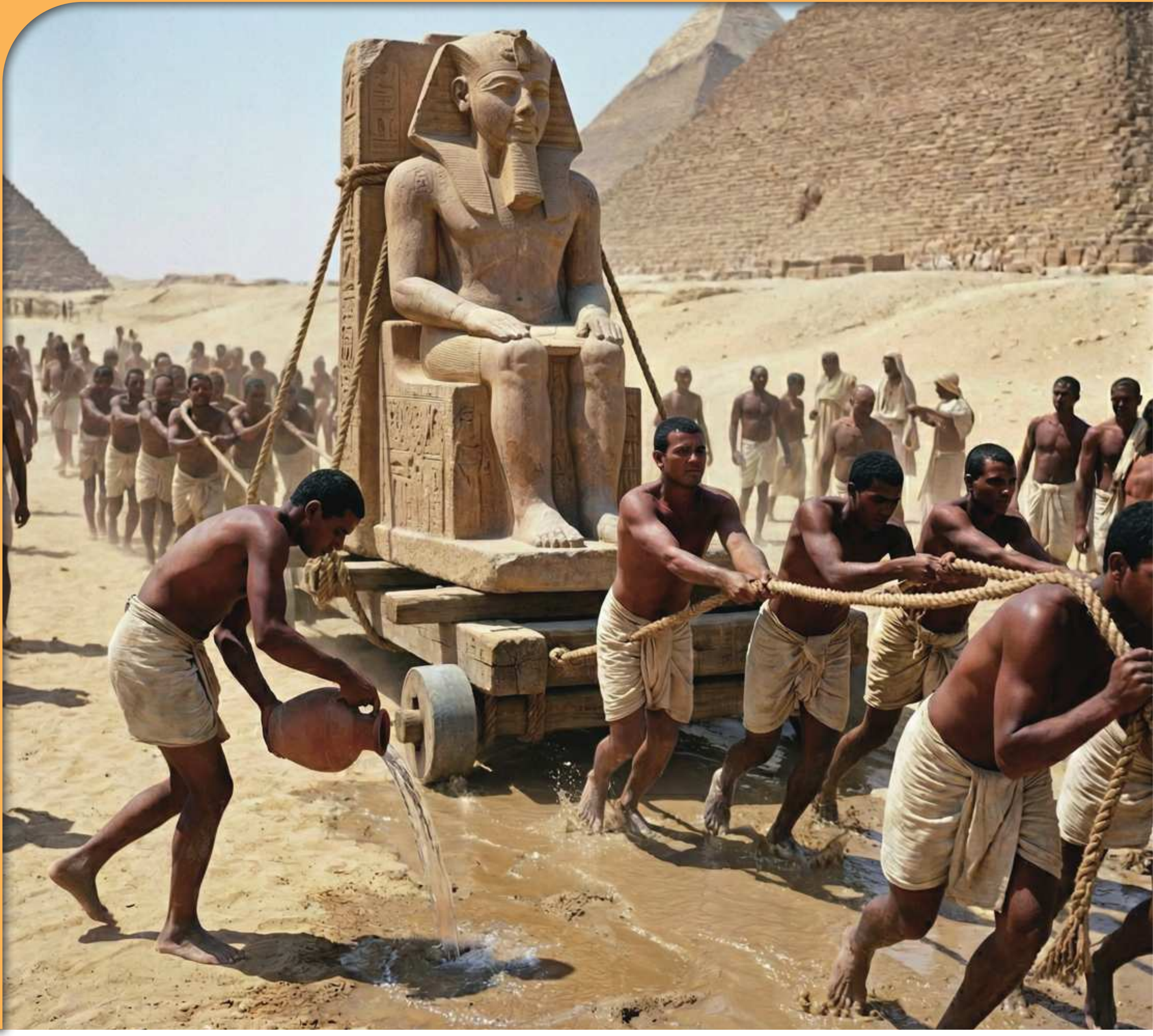
A: Water passes through desert sand faster than farm mud.

B: Soil with very small particles like clay easily forms puddles.

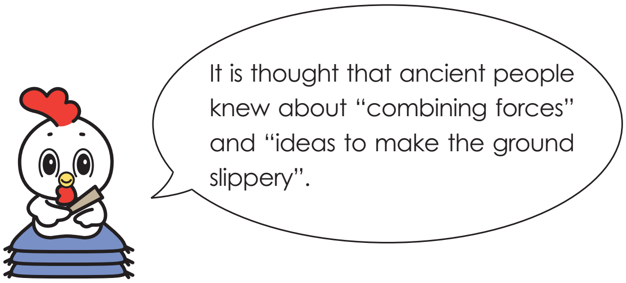
C: Ground with large particles like gravel is hard for water to soak into.

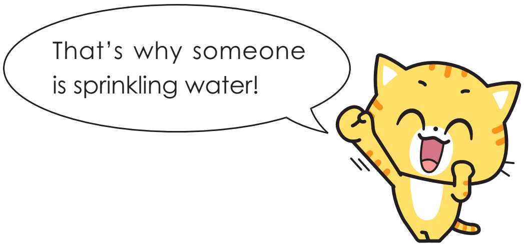
8-2 Transporting Giant Stone Statues

Chapter 8 ····· Soil, Water, and Life in Egypt



How did ancient Egyptians move heavy stone statues?

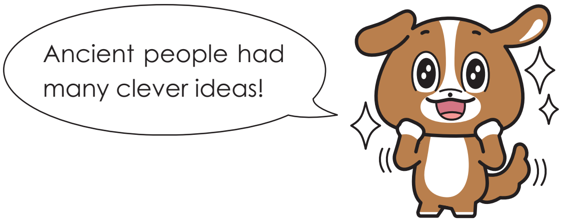

It is thought that ancient people knew about "combining forces" and "ideas to make the ground slippery".


That's why someone is sprinkling water!

Point! Combining forces / Making it slippery

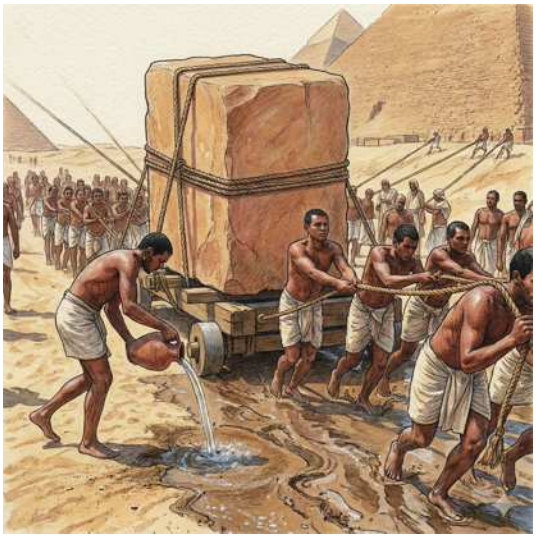
To move a giant stone statue, a very large force was needed.

- Combining forces:
  By many people pulling the ropes in **the same direction**, they added up small forces to create a large force.
- Making it slippery:
  By sprinkling water on the ground to make it **slippery**, they **reduced the force needed to move it.**


Ancient people had many clever ideas!

Warm Up Let's observe how they move a giant stone statue!

Look at the illustration (based on an ancient Egyptian mural) and find their ideas.



❶ **Look at the number of people:**

Because one person cannot move the stone statue, many people are combining their forces to move it.

❷ **Look at the ground:**

There is a person sprinkling water on the sand in front of the sled.

❸ **Think about the reason:**

Why are they sprinkling water?

Let's discuss the idea of making

the sled slip easily on the sand.

Try

(1) When moving a heavy stone statue, why do many people pull the rope? Choose the correct answer from below.

A: To make a larger force than when there is only one person.

B: Because if it's only one person, they will carry it in the wrong direction.

C: Because carrying heavy things makes you hungry.

(2) When moving a heavy object, if you make the ground slippery, what happens to the force needed? Choose the correct answer from below.

A: The force needed doesn't change.

B: You will need a larger force.

C: You need less force.

Exercise

(1) Why do they sprinkle water on the ground in front of the sled? Fill in the blank with the correct word.

To make the ground (   ), so they can move it with less force.

(2) Choose the correct answer about transporting Egyptian stone statues from below.

A: A small number of people can combine their forces more easily to move the stone statue.

B: By combining the forces of a large number of people, they moved the giant stone statue.

C: By making the ground hard with water, they moved the giant stone statue.

Mastering the Observation Record Card

Let's write our observation record cards correctly so we can review what we observed later or share it with friends and teachers.

Basic Items for Recording

- **Title (What you investigated)**

  Write it so people can see what you observed at a glance.

- **Date, Time, and Name**

  Record when and who did the investigation.

- **Size, Color, and Shape**

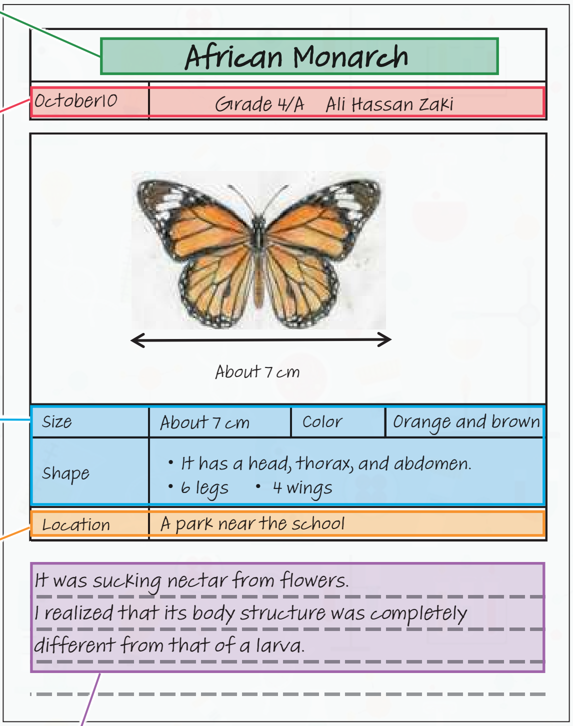
  Write down the characteristics of what you observed.

- **Where you found it**

  Write specifically where you found it, such as on the ground, in the grass, or near the river.

- **What you noticed and your thoughts**

  Write down what you learned or what you wondered about.



African Monarch

October10 | Grade 4/A Ali Hassan Zaki

About 7 cm

Size	About 7 cm	Color	Orange and brown
Shape	• It has a head, thorax, and abdomen. • 6 legs • 4 wings		
Location	A park near the school		

It was sucking nectar from flowers.
I realized that its body structure was completely different from that of a larva.

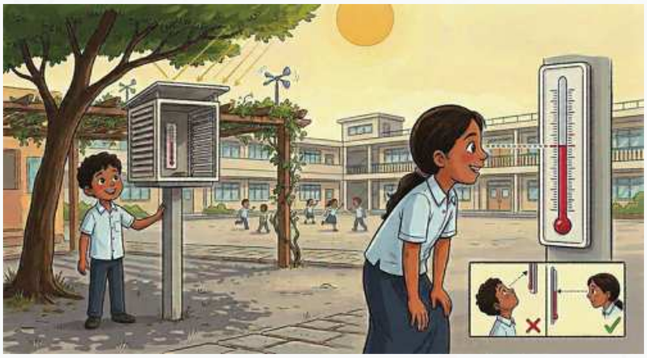
How to Use Observation Tools ①: Thermometer

This is a manual for measuring the correct air temperature and ground temperature.

1 How to measure air temperature

- **Height:**
  Measure at a height of 1.2 to 1.5 meters above the ground.

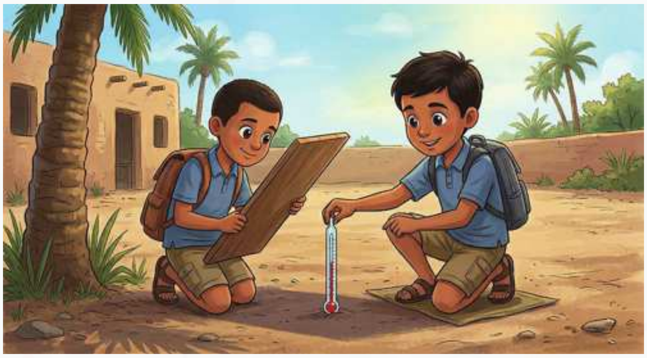
- **Place:**
  Choose a well-ventilated place away from direct sunlight.



- **How to read the scale:**
  Read the temperature by looking straight across at the top of the red liquid.

2 How to measure ground temperature

- **Make shade:**
  If direct sunlight hits the thermometer, you cannot measure the correct temperature. Use a board or your own body to make shade before placing it on the ground.



- **Caution:**
  Do not touch the part where the red liquid is stored (the bulb) with your fingers. Hold the top of the thermometer so the heat from your hands does not transfer to it.

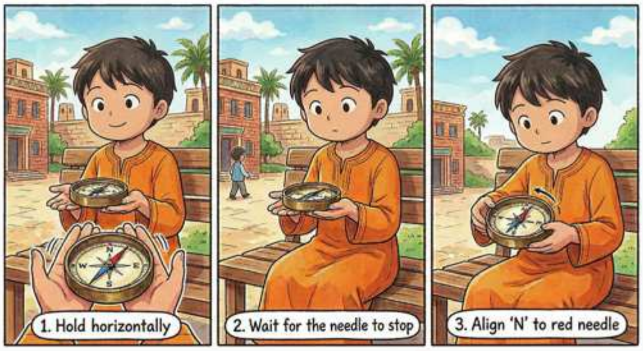
How to Use Observation Tools ②: Compass

We use this to correctly record the direction a shadow moves or where the sun sets.

How to Use a Magnetic Compass

1 Place it flat:

Place the compass flat on your palm or on the ground.


1. Hold horizontally
2. Wait for the needle to stop
3. Align 'N' to red needle

2 Wait for the needle to stop:

Wait until the needle stops moving.

3 Align the dial:

Turn the compass slowly to align the red tip of the needle with the letter "N" (North) on the dial.

4 Read the direction:

Now you can tell the directions for East, West, South, and North.

[Caution]

Keep away from iron:

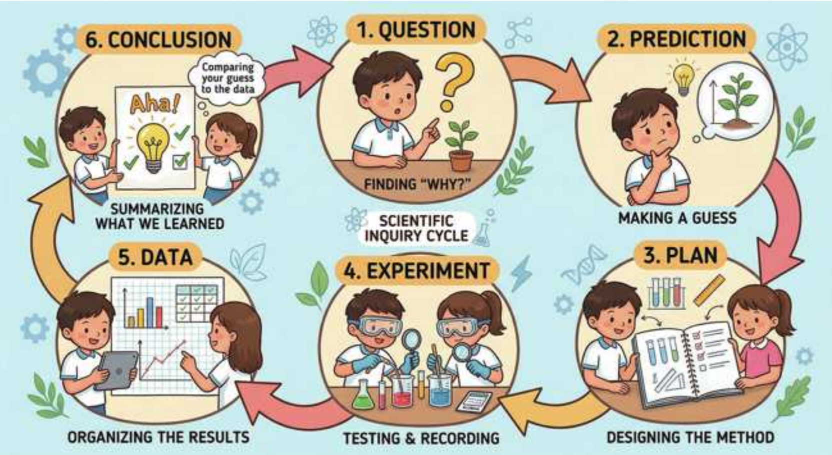
The needle will not move correctly near iron desks, magnets, or smartphones.

How to Do Science (Scientific Inquiry Cycle)

Let's learn the "professional way" to solve mysteries.

6 Steps of Inquiry

1. **Question:**
   Find questions like "Why?" or "How?".
2. **Prediction:**
   Make a guess about the answer based on your past experiences.
3. **Plan:**
   Decide which conditions to compare and which to keep the same, and plan your experiment method.
4. **Experiment & Observation:**
   Use your tools correctly and write down the results on your record card.
5. **Data (Results):**
   Organize what you investigated into tables or graphs.
6. **Conclusion:**
   Compare your prediction with the results and summarize what you learned.


6. CONCLUSION
Comparing your guess to the data
Aha!
SUMMARIZING WHAT WE LEARNED
1. QUESTION
FINDING "WHY?"
2. PREDICTION
MAKING A GUESS
SCIENTIFIC INQUIRY CYCLE
5. DATA
ORGANIZING THE RESULTS
4. EXPERIMENT
TESTING & RECORDING
3. PLAN
DESIGNING THE METHOD

- **Tips for a Fair Test**

When comparing something, change only the condition you want to test, and keep all other conditions exactly the same. Example) When testing how a car moves depending on the size of the sail, keep the wind strength the same.

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